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and
Dr. Grace Rogers Spalding
for their pioneer efforts and
selfless devotion in behalf
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Editor—Maynard K. Hine, D.D.S.
1121 West Michigan St., Indianapolis 2, Indiana

ASSOCIATE EDITORS
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Dr. Raoul H. Blanquie has long been an active periodontist in California. He is past president of the San Francisco Dental Society, the California State Dental Association, and the California Academy of Periodontology. For many years he was special lecturer in Periodontia in the University of California; associate clinical professor of Periodontia in the College of Physicians and Surgeons in San Francisco, and former chairman of the dental staff of the French Hospital in San Francisco. He is author of over two dozen papers in the field of periodontology.

THE JOURNAL OF PERIODONTOLOGY

APRIL, NINETEEN HUNDRED FIFTY-SEVEN

The Effects of Vertical Occlusal Trauma on the Periodontium of Protein Deprived Young Adult Rats*

by S. S. STAHL, S. C. MILLER AND E. D. GOLDSMITH, *New York, New York*

RECENT studies have focused attention on the alteration in the periodontal tissues in protein deprived animals. The reported changes consisted primarily of osteoporosis of the alveolar supporting bone and degeneration of the connective tissue fibers of the periodontal membrane.[1,2,3,4,5] Similar changes have also been noted in non-oral tissues of protein deprived animals[6,7,8] and in the oral tissues of rats on partial inanition.[9] The level of epithelial attachment in the above mentioned studies did not appear to be affected by these dietary alterations. Changes in epithelial attachment levels, with inflammation and subsequent degeneration of the underlying periodontal structures, have been reported following experimentally produced gingival irritations in normal animals.[10,11,12,13] Superimposition of gingival irritants in starving animals have caused greater alveolar bone resorption in areas next to the gingival inflammation than a similar irritant caused in normal animals.[14] Protein deprived and gingivally irritated animals showed a greater degree of alveolar crest resorption, degeneration of periodontal fibers and apical proliferation of the epithelial attachment than was noted in gingivally irritated animals on a normal diet.[15]

The question of the effects of occlusal trauma on the periodontium has recently been restudied in experimental animals. Necrotic changes in the periodontal membrane and resorption of alveolar bone on the pressure side with widening of the periodontal membrane and bone formation on the tension side have been reported. Initiation of apical proliferation of the epithelial attachment was not seen under these experimental circumstances[16,17] except under extremely unfavorable conditions.[18]

Addition of systemic stresses in animals, wearing short-term orthodontic appliances, showed some increase in degenerative changes on the tension side of the periodontal membrane of the systemically stressed animal; however, a clear cut change was not observed. No pocket formation was noted in these procedures.[19]

The object of the present study was to investigate the effects on the perio-

*Investigation was supported in part by a grant-in-aid from the National Institute for Dental Research of the National Institute of Health, United States Public Health Service. From the Murry and Leonie Guggenheim Institute for Dental Research, Department of Periodontia and Oral Medicine, and Department of Histology, New York University College of Dentistry, New York, N. Y.

TABLE I

Group No.	No. of Animals	Type of Diet	Type of Irritant	Time of Experiment
1	9	purina chow (powdered)	amalgam filling	6 weeks
2	6	purina chow (powdered)	amalgam filling	12 weeks
3	11	protein free* (powdered)	amalgam filling	6 weeks
4	10	protein free for 6 wks. followed by a normal diet for 6 wks.	amalgam filling	12 weeks
5	14	protein free (powdered)	none	6 weeks
6	9	protein free for 6 wks. followed by a normal diet for 6 wks.	none	12 weeks
7	9	purina chow (powdered)	non-occlusion	6 weeks
8	11	purina chow (powdered)	none	6 weeks
9	3	purina chow (powdered)	none	12 weeks
82 Animals: Total				

*Feeds were prepared by Nutritional Biochemicals, Cleveland, Ohio.

dontium of long-term, vertical occlusal stresses in protein-deprived animals and to compare these findings with those reported previously following gingival irritation.[20]

MATERIAL AND METHOD

Eighty-two Long-Evans Strain male rats, weighing an average of 290 grams at the beginning of the experiment, were divided into two dietary groups and then subdivided into groups with or without occlusal irritants. The diets used were of the same consistency and differed essentially only in their protein content. Feed and water were provided ad libidum. Following an initial six-week experimental period, a number of animals in the groups on the protein deprived diet were sacrificed, while the remainder was placed on a normal purina chow diet for an additional six-week period. (Table I)

At the beginning of the experiment, under nembutal anesthesia, an occlusal channel was cut into the maxillary first and second molars of one side in groups 1, 2, 3 and 4. (Table I) The cavity was filled with amalgam and carved level with the highest occlusal cusp, thus presenting a flat, high occlusal table. In order to obtain proper retention of the filling, the cut had to be extended in depth, creating pulpal exposures. In group 7, the occlusal cusps of the first maxillary molar on one side were ground flat, creating an area of non-occlusion. The animals were maintained for six and twelve weeks respectively, at which time they were sacrificed and the mandible and maxillae dissected out. These tissues were roentgenographed, fixed in formalin, decalcified in 5% nitric acid, sectioned and stained with hematoxylin and eosin.

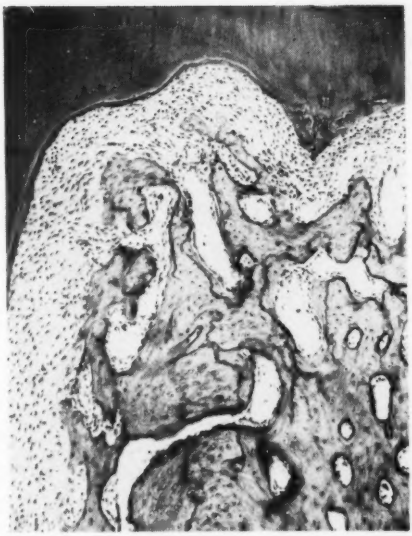

Fig. 1. Photomicrograph of the distal and crestal areas of the interradicular septum of the maxillary first molar of a rat on a normal diet. Hematoxylin-eosin stain, Magn. x100. Note the cellularity and the normally appearing alveolar bone.

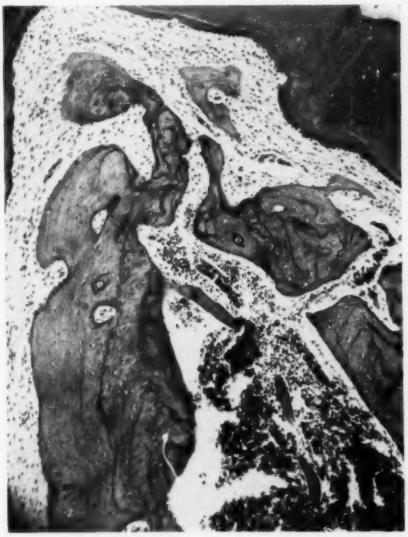

Fig. 2. Photomicrograph of the distal and crestal areas of the interradicular septum of the maxillary first molar of a rat on a protein free diet for a six week period. Hematoxylin-eosin stain, Magn. x100. Note the enlarged marrow spaces and reduction in cellularity of the periodontal membrane.

OBSERVATIONS

General: The animals on the purina chow diet all showed weight gains, while the groups on the protein deprived diet weighed approximately one-half of their original body weight at the end of the six weeks and appeared moribund. The animals in groups 4 and 6 which received a normal diet for six weeks, following six weeks of protein deprivation, gained weight and at the end of the twelve weeks had surpassed their original body weight. They appeared and acted normally.

Jaws: Animals on Protein Deprivation for Six Weeks—Histologic findings in the protein deprived group were similar to those reported in previous investigations[1, 2, 4, 15] and consisted primarily of enlargement of the marrow spaces noted especially in the interradicular septum, reduction in the number of osteoblasts and a decrease in the cellular components of the marrow. The alveolar crest height appeared unaffected. The periodontal membrane stained paler and appeared less cellular when compared with the control group. Edema and some disorganization of fiber bundles was also seen in the protein deprived group (Fig. 1, 2, 3). Downgrowth of the epithelial attachment was generally not observed except in areas of food impaction and subsequent inflammatory involvement. While the changes described above were observed in all animals of the group, the degree of severity varied with individual animals.

Animals with Occlusal Irritant and Normal Dietary Intake for Six Weeks: Changes in the supporting structures of the maxillary first molar of this group were more evident in the interradicular than in the interproximal areas. Disorganization of fiber bundles, edema and degeneration of fibers were noted in the periodontal membrane in many animals (Fig. 4). Repair processes were also taking place as evidenced by the presence of an increased number of non-oriented young fibroblasts noted in

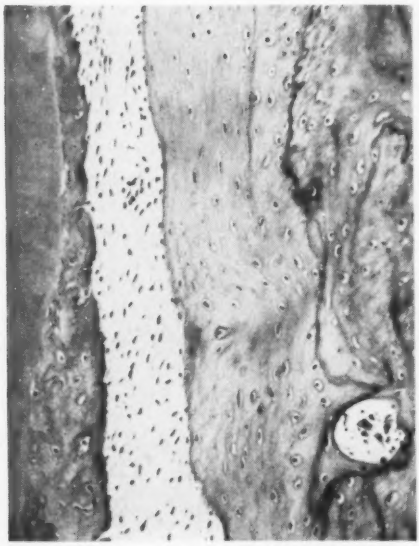

Fig. 3. Photomicrograph of a higher magnification of the periodontal membrane shown in Fig. 2. Hematoxylin-eosin stain, Magn. x200. Note the pale staining, fibrillar appearance of the collagen fibers with evidence of lack of organization of the bundles.

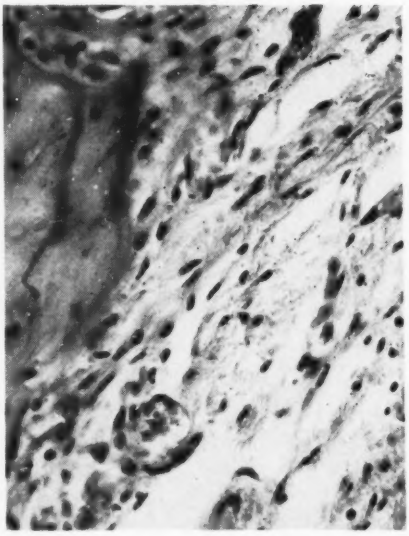

Fig. 4. Photomicrograph of an area of the interradicular periodontal membrane of the maxillary first molar in an animal on a normal dietary intake, wearing an occlusal irritant for a period of six weeks. Hematoxylin-eosin stain, Magn. x400. Note the marked disorganization of the periodontal fibers.

various areas of the membrane (Fig. 5), and functional repair seen at the periodontal surfaces of the alveolar bone. In some animals, narrowing and crushing of the periodontal space at the interradicular crest, due to the pressure of the tooth against bone, was also observed (Fig. 6).

The periodontal membrane and alveolar septum in the interproximal areas appeared markedly less affected. The epithelial attachment, except in areas of food impaction, showed no evidence of apical proliferation.

The periodontal structures of the mandibular first molar showed edema in the periodontal membrane, especially at the interradicular crest where cementum resorption was also observed (Fig. 7). The alveolar bone showed little change.

Animals with Occlusal Irritants and Protein Free Dietary Intake for Six Weeks: The periodontal supporting structures of the maxillary first molar of this group

Fig. 5. Photomicrograph of an area of the interradicular periodontal membrane of the maxillary first molar in an animal on a normal dietary intake, wearing an occlusal irritant for a period of six weeks. Hematoxylin-eosin stain, Magn. x400. Note the presence of a large number of young fibroblasts.

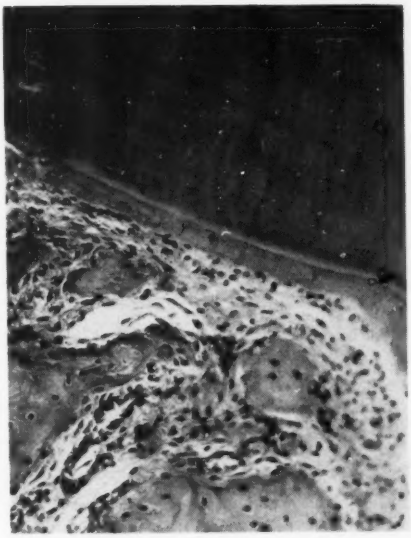

Fig. 6. Photomicrograph of an area of the interradicular periodontal membrane at the interradicular crest, of the maxillary first molar in an animal on a normal dietary intake, wearing an occlusal irritant for a period of six weeks. Hematoxylin-eosin stain, Magn. x400. Note the reduced periodontal space with crushing of the fibers in the area.

showed changes in the periodontal membrane, similar to those seen in the group with an occlusal irritant alone, except that the degenerative changes of the periodontal fibers appeared more pronounced. Evidence of repair was generally lacking (Figs. 8, 9, 10). The periodontal surfaces of the alveolar bone showed a marked decrease of osteoblasts (Fig. 9) and fewer areas of functional repair. In this group, too, crushing of periodontal fibers by forcing the alveolar bone against the tooth at the interradicular crest was observed in some sections (Fig. 11). Inflammatory infiltration was not observed in areas of periodontal membrane degeneration in normally fed or protein free groups, which is in accord with the findings of other investigators.[16] The alveolar crest height and the position of the epithelial attachment appeared unaffected (Fig. 12).

The primary changes in the periodontal structures of the mandibular first molar was an increase in edema and disorganization of the fibers at the interradicular crest which was more intense than the changes observed in the group on local irritation alone (Fig. 13).

Animals on Normal Dietary Intake and non-Occlusion of the First Molars for Six Weeks: Removal of the cusps of the maxillary first molar was associated with an apical proliferation of the epithelial attachment in the interproximal area, subepithelial inflammatory infiltration and resorption of the alveolar bone crest (Fig. 14). It should be noted that these gingival changes may be the result of local irritation due to the heavy accumulation of debris and food impaction noted around the broken crown.

A marked change was noted in the interradicular periodontal membrane of the mandibular first molar, where a narrowing of the periodontal space and a lack of principal fibers was observed. The periodontal membrane appeared as a loosely arranged network of connective tissue (Fig. 15). These changes are consistent with those described in non-functioning teeth.[21]

Animals Placed on a Normal Diet Following Six Weeks of Protein Deprivation: The re-institution of a normal diet led to replacement of endosteal bone in the alveolus of all animals. The periodontal

Fig. 7. Photomicrograph of the interradicular septum of the mandibular first molar in an animal on a normal dietary intake, wearing a maxillary occlusal irritant for a period of six weeks. Hematoxylin-eosin stain, Magn. x90. Note areas of cementum resorption at the crest.

Fig. 8. Photomicrograph of the interradicular septum of the maxillary first molar in an animal on a protein free diet and wearing an occlusal irritant for a period of six weeks. Hematoxylin-eosin stain, Magn. x90. Note the marked disorganization of the periodontal membrane.

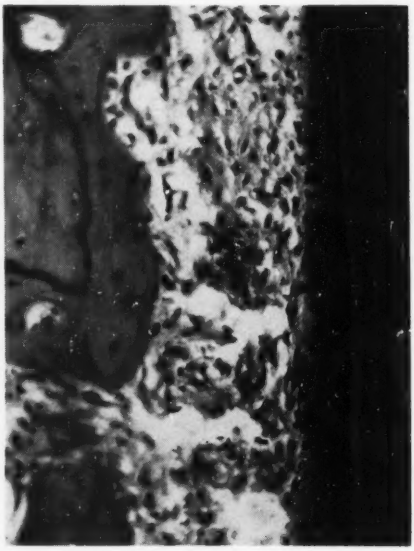

Fig. 9. Photomicrograph of area A of Fig. 8. Hematoxylin-eosin stain, Magn. x350. Note disorientation of periodontal membrane fibers and reduction in number of osteoblasts lining the alveolar surface.

Fig. 10. Photomicrograph of area B of Fig. 8. Hematoxylin-eosin stain, Magn. x350. Note the marked edema in the periodontal membrane.

Fig. 11. Photomicrograph of the interradicular crest of the maxillary first molar in an animal on a protein free diet and wearing an occlusal irritant over a six week period. Hematoxylin-eosin stain, Magn. x200. Note the crushing of the periodontal membrane at the crest.

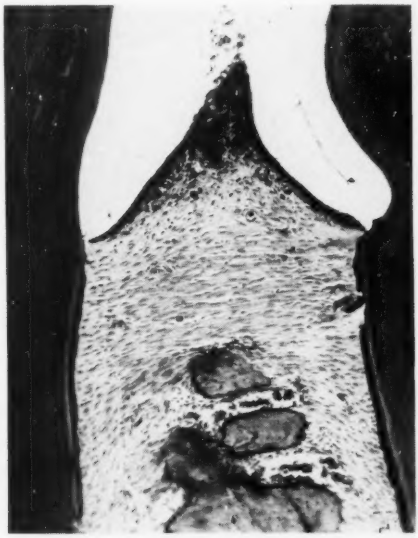

Fig. 12. Photomicrograph of the interdental papilla between the maxillary first and second molars in an animal on a protein free diet and wearing an occlusal irritant over a six-week period. Hematoxylin-eosin stain. Magn. x90. Note the apical position of the epithelial attachment at the cemento-enamel junction.

Fig. 13. Photomicrograph of the interradicular crest of the mandibular first molar in an animal on a protein free diet and wearing an occlusal irritant over a six week period. Hematoxylin-eosin stain. Magn. x90. Note the edematous appearance of the periodontal membrane at the crest as well as the enlarged marrow spaces of the alveolar bone.

Fig. 14. Photomicrograph of the interdental septum between the first and second maxillary molars of an animal on a normal dietary intake in which the cusps of the maxillary first molar were removed. Hematoxylin-eosin stain. Magn. x90. Note the apical proliferation of the epithelial attachment and resorption of the interdental alveolar bone.

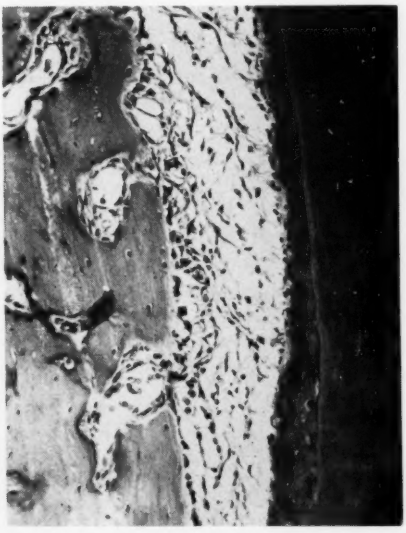

Fig. 15. Photomicrograph of a section of the interradicular periodontal membrane of the mandibular first molar in an animal on a normal dietary intake and non-occlusion of the first molars. Hematoxylin-eosin stain. Magn. x200. Note the loosely arranged network of fibers in the periodontal membrane.

Fig. 16. Photomicrograph of the interradicular septum of the maxillary first molar in an animal on a normal diet, wearing an occlusal irritant for a period of twelve weeks. Hematoxylin-eosin stain. Magn. x60. Note the lack of interradicular alveolar bone and the walling off of the periapical abscess.

Fig. 17. Photomicrograph of the interradicular septum of the maxillary first molar of an animal on a protein free diet for six weeks, followed by a normal dietary intake for six weeks and wearing an occlusal irritant over the total twelve-week period. Hematoxylin-eosin stain. Magn. x60. Note the partial resorption of the interradicular alveolar bone and the presence of an inflammatory exudate at the apex.

membrane appeared normal. A slight apical proliferation of the epithelial attachment was noted; however, a similar change was seen in the control group and may be the result of physiologic aging.

Animals with Occlusal Irritant and Normal Dietary Intake for Twelve Weeks: The supporting structures of the maxillary first molar showed evidence of periapical inflammation and resorption of the interradicular alveolar septum with replacement by fibrous connective tissue (Fig. 16). These changes may be the result of the spreading of the periapical inflammation with subsequent localization and repair in the presence of vertical occlusal trauma. (The effects on the interradicular bone of periapical inflammation and occlusal trauma is being investigated at present.) The interdental alveolar septum and the level of the epithelial attachment appeared unaffected.

The periodontal structures of the mandibular first molar appeared essentially unaltered except for evidence of edema in the periodontal fiber bundles at the interradicular crest.

Animals with Occlusal Irritant on Protein Deprivation for Six Weeks and Subsequent Replacement on a Normal Diet for an Additional Six Weeks: The supporting structures of the maxillary first molar showed periapical inflammation and resorption of the interradicular crest with replacement by fibrous connective tissue. In some animals of this group, however, the resorption of the alveolar bone was not as complete, nor was the periapical inflammatory infiltrate well localized when compared to the group wearing an occlusal irritant, but receiving a normal diet throughout the experiment (Fig. 17). The interproximal alveolar bone and the epithelial attachment level appeared essentially unaffected (Fig. 18).

The periodontal structures of the mandibular first molar showed edema in the periodontal membrane, especially at the interradicular crest. No other significant changes were observed.

DISCUSSION

The observations in this study indicate

that vertical occlusal trauma, under the conditions of the experiment, primarily caused degenerative changes in the periodontal membrane which were reversible as evidenced by the presence of repair processes in the tissues of the animals fed normal diets. The outstanding changes seen in protein deprived animals was an osteoporosis of the alveolar bone and a decreased cellularity of the periodontal membrane. The superimposition of an occlusal irritant in these animals led to degenerative changes in the periodontal membrane similar to those seen in the normally fed group. However, in this group a lack of reparative processes was noted which might also account for the delay in localization of the existing periapical inflammatory infiltrate observed in some animals. This interference with repair may be due to a lack of protein, or may be the result of a general inanition, or a combination of both factors which is present in animals placed on protein free diets.

It is of interest to note that the primary degenerative changes were observed in the interradicular area which might be the result of the excessive load borne by this area in vertical occlusal irritation. The observation of tooth impingement of the periodontal membrane due to the high filling, as seen by the narrowed periodontal space at the interradicular crest, is evidence of the use of the irritated side by the animal in masticatory function.

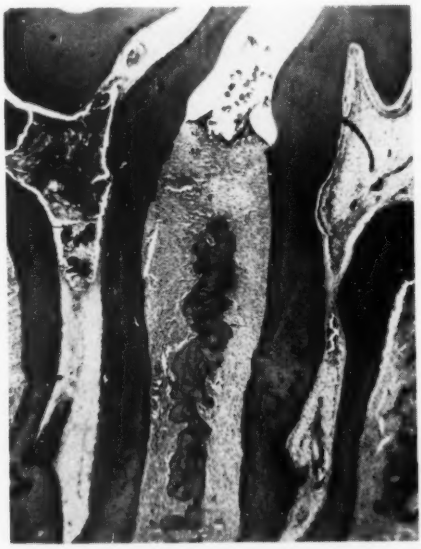

Fig. 18. Photomicrograph of the interdental papilla between the first and second maxillary molars in the animal described in Fig. 17. Hematoxylin-eosin stain. Magn. x60. Note the apical position of the epithelial attachment at the cemento-enamel junction.

It is of further interest to note the lack of change in the epithelial attachment position, under these experimental conditions, in occlusal irritation alone and in occlusal irritation and protein deprivation, in contrast to the apical proliferation of the attachment observed when food impaction is present. These observations of epithelial attachment proliferation in areas of gingival irritation are similar to those described when a gingival irritant in form of an interproximal wire was used.[15]

Reconstitution of a normal diet, following deprivation, induced evidence of repair in the animals on protein deprivation alone, but could not reconstitute the normal morphology of the periodontal tissues in the locally irritated animals during the experimental period.

From observation in this and our previous studies, it would seem that, under these experimental conditions, local gingival irritation is primarily responsible for apical proliferation of the epithelial attachment with concomitant inflammatory changes at the site of irritation. Systemic stressors, in the form of dietary depletion, interfere markedly with the repair processes and thus may reduce the animals ability to first contain and subsequently to repair the damage caused by the irritant. This interference with localization and repair is seen in both gingival and periapical irritations. Vertical occlusal trauma appears to weaken the underlying supporting dental structures and may thus accelerate the spread of gingival inflammation.

SUMMARY AND CONCLUSION

Eighty-two male rats weighing an average of 290 grams at the beginning of the experiment were divided into two dietary groups and then subdivided into groups with or without occlusal irritation. The occlusal irritant consisted of an amalgam filling carved flat to the level of the highest occlusal cusp which was placed into the occlusal surface of the maxillary first and second molar on one side. The animals were sacrificed after a six or twelve week experimental period.

Protein deprivation caused marked weight loss and, in the oral structures, an osteoporosis of the supporting alveolar bone with a decrease in the cellularity of the periodontal membrane.

The addition of an occlusal irritant in protein-free-fed animals caused a disorganization and degeneration of periodontal membrane fibers, thrombosis of vessels and lack of repair of the periodontium.

Animals wearing an occlusal irritant, but fed a normal diet, showed less severe degenerative changes of the periodontal membrane than the protein deprived group and evidence of active repair. The interproximal alveolar crest height and the position of the epithelial attachment appeared unaltered in all groups studied. Apical proliferation of the epithelial attachment was observed only in areas of gingival irritation, i.e. food impaction, broken crowns.

Replacement of a normal diet following a six-week protein deprived period caused repair of the periodontal membrane and replacement of alveolar bone in animals on protein deprivation alone. It did not restore the normal tissue morphology in local areas of irritation in animals with occlusal trauma.

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The Temporomandibular Joint and Occlusion

by L. LASZLO SCHWARTZ, D.D.S., *New York, New York*

THE relationship of the temporomandibular joint to occlusion has preoccupied dentists for over fifty years. Many explanations have been offered. No single one has gained general acceptance and today many different concepts are being vigorously promulgated, and as heatedly defended. Perhaps by examining some clinical observations in the light of the sciences of anatomy, physiology and pathology, we may be able to start to separate clinical observation from scientific fact, from pure hypothesis. Such an inventory would be a step forward. A discussion along these lines may provide no new answers. But to formulate questions clearly is also progress.

This opinion as to the relationship of the temporomandibular joint to occlusion is based primarily on clinical research. It can be expressed by expanding the title of my paper to read: the temporomandibular joint, its relative unimportance in everyday problems of occlusion.

One should not imply that the temporomandibular joint itself is unimportant. For the proper functioning of a physiological system, such as the masticatory system, no single organ can be dismissed as being of no consequence. Function depends upon the integrated activity of different organs. In the masticatory system, the organs, whose combined activity enables the individual to bite, chew, suck, yawn, speak, sing, kiss in love or gnash teeth in hatred, consist essentially of teeth embedded in jaw bones, moved by intricate groupings of muscles about a complex pair of joints. But the fact is inescapable that some of these organs are either dispensable or replaceable, while others are not. No small part of practice comes to us because of our ability to replace missing teeth. In ankylosis of the temporomandibular joints, the diseased joints are surgically removed to permit mandibular movement. Prostheses are used to substitute for missing parts of the maxilla and transplants to maintain the continuity of the mandible. Only muscles are indispensable. They are the active organs; teeth, jawbones and joints all being passive, doing what muscles make them do. And when we speak of muscles, we include, of course, the complex nervous system, central and peripheral, which controls and directs them.

The primacy of muscles in the masticatory system seems self-evident. Sicher[1] wrote that: "The difficulties in understanding the mechanics of the temporomandibular articulation are caused mainly by the fact that the movements of the mandible are directed, far less than in other joints, by the shape of the articulating bones and by the articular ligaments, and, to a far higher degree, by the play of the muscles." Yet, it took over five years of intensive clinical research to see what should have been obvious from the first. I should like

to tell you how this happened, and what I think stood in the way of our seeing the obvious.

THE INVESTIGATIONS OF THE TEMPOROMANDIBULAR JOINT CLINIC

About seven years ago, a small group of men got together at the dental school at Columbia to see what could be done to help the increasing numbers of patients being referred from the medical departments of the Columbia-Presbyterian Medical Center with symptoms believed to be associated with the temporomandibular joint. At the time, the dominant approach was that provided by Costen,[2] who in 1934 had described a symptom-complex, now bearing his name, characterized by multiplicity of symptoms and simplicity of treatment. The symptoms included loss of hearing, vertigo, tinnitus and pain. The treatment consisted of bite raising. It soon became evident that this simple expedient was not effective. A period followed during which many different kinds of treatment were tried, including the use of orthodontic and other appliances, the selective grinding of teeth and occlusal alteration by means of dental restoration. Meanwhile, the oral surgeons, under the influence of Schultz[3] infiltrated joints with sclerosing solution. Regardless of the particular treatment used, the conclusion was inescapable. Our patients rarely got better. A review of the dental literature did not help. We then decided to follow the advice of Paracelsus, the 16th century physician. We made our patients our textbooks.

All treatment was stopped. We listened patiently to the symptoms of our patients. By 1953, 256 patients, mostly women, had been seen. We found that over 90% complained of facial pain, usually in conjunction with some kind of mandibular dysfunction. Limitation was most prevalent. Recurrent dislocation or clicking in the temporomandibular joint was less frequently found. We enlisted the aid of many medical departments for diagnostic surveys. The incidence of organic disease was extremely low.[4,5]

Once it was clear that we were dealing, in the main, with a functional disturbance, analyzing our findings in the light of basic science and reviewing the medical literature led to the conclusion that muscle spasm was responsible for both the pain and the mandibular dysfunction. The clinical picture of spasm of the masticatory muscles was similar to that found in the neck, shoulder, elbow, and wrist. In patients complaining of temporomandibular joint pain and dysfunction, painful, rigid masticatory muscles were often found. Since the use of local anesthetics, sprayed on the skin overlying the muscles or infiltrated into them, followed by exercise, was widely used in the treatment of muscle spasm, we utilized this treatment for the masticatory muscles.[4,5] The results were both gratifying and encouraging.

THE TEMPOROMANDIBULAR PAIN-DSYFUNCTION SYNDROME

When about 500 patients had been examined, the conclusion was reached that the symptom-complex with which we were dealing was a temporomandibular joint pain-dysfunction syndrome.[6,7] This syndrome often first manifested itself as incoordination of the mandibular muscles, in the form of clicking and recurrent dislocation. These symptoms were often followed by spasm of the masticatory muscles, characterized by painful, limited mandibular movement which continued in the form of a self-perpetuating charleyhorse of the jaw. When recovery did not occur either spontaneously or through treatment, contracture sometimes followed. Here the symptom was limited movement, without pain.

Attempts were made to identify the many factors that seemed to be involved in this syndrome. Psychiatric examinations revealed the prevalence of emotional tension, accompanied often by subconscious oral habits.[8,9] Some patients had been alarmed by earlier diagnoses and had reacted badly to previous treatment. Some gave past histories of general musculo-skeletal

difficulties. Many stated that they first became aware of their symptoms following dental treatment. A hypothesis was advanced, now being tested, which holds that, in patients predisposed by constitution and temperament, sudden or prolonged stretch of the masticatory muscles, or proprioceptive changes following sudden or extensive changes in occlusion, precipitates muscular incoordination or spasm.[7]

One thing was impressive about these patients,—the lack of that stability of mandibular posture and movement, which the use of an articulator must have as its premise. Sicher[1] had observed: "That in spite of this relative freedom of the mandibular articulation, the movements, for instance, masticatory or opening movements, are characteristic for, and constant in, (in) each individual, is due to the automatic pattern of such movements just as, for instance, gait is characteristic of an individual." Since this constancy of mandibular movement was not true of the group of patients examined, one can not only question the dependability of articulators, but began to try to understand the source of the kind of thinking which, for over half a century, had preoccupied itself with the search for a mechanical device, as the key to occlusion.

THE DEVELOPMENT OF CONCEPTS OF OCCLUSION

As early as 1771, John Hunter,[10] an English anatomist, as a result of dissection and experiment, described in almost modern terms, the anatomy and some of the physiology of the masticatory system. At a time, however, when fillings were ineffective, extractions painful, replacements crude, a dentistry which was not even a formal profession could hardly be expected to interest itself in basic science. The most rudimentary technical problems were yet to be solved. So rapid, however, was technical progress that, as the nineteenth century came to a close, dental procedures had become effective.

With the development of the porcelain tooth and the vulcanite base, the mainstays of full denture work, it was natural for questioning practitioners to seek some rationale for placing artificial teeth on a denture base. Bonwill,[11] a mathematician, found what he called "nature's plan" in his equilateral triangle. Walker,[12] who observed that dentures which balanced on Bonwill's articulator did not balance in the mouth, pointed to the absence of condylar inclination. His work led to condylar readings. Gysi,[13] added incisal path readings, while Monson,[14] a student of Bonwill, made his triangle three-dimensional by looking upon it as a segment of a sphere.

One can thus discern two streams of development: one arising in Bonwill emphasizing the geometric ideal, another in Walker stressing the dominating role of the temporomandibular joint in mandibular movements. In common, however, is the expression of each concept mechanically, by means of an articulator. It is the need to be able to reproduce mandibular movements mechanically which has stood in the way of understanding them.[15]

This discussion emphasizes biological understanding, rather than either mechanics or the ideal in occlusion. Milo Hellman[16] pointed to an important source of our difficulties, when after exhaustive anthropological investigations, he concluded that the concept of the normal occlusion as representing 100% perfection is a myth, having neither biologic nor scientific foundation.

It is perhaps too much to hope that we will quickly abandon the search for the philosopher's stone,—the articulator that will really reproduce individual mandibular movements. Gysi[17] expressed the philosophy behind this search when he stated that: "The problem of articulation is, in my opinion, not completely solved, even though we may know all the movements of the mandible theoretically, until these movements can be exactly imitated mechanically." To achieve this mechanical imitation, each investigator in his time thought he saw exactly what was lacking in the articulator of his predecessor that had

caused it to fail. Thus, there were added, in turn, provisions for fixed condylar inclination, variable condylar inclinations, incisal path readings, and finally, the Bennett movement.

ARTICULATORS: MECHANICAL VS. PHYSIOLOGICAL THINKING

We should realize that articulators, and the mechanical thinking they represent, grew out of the full denture period of dentistry, but we should not forget that even during this period there were those who recognized the basic failing of a mechanical device. William Trueman,[18] a contemporary of Bonwill, wrote in 1887: "Could we remove the very jaws we are adapting the denture to and use them as an articulator, it would be impossible to know with any degree of accuracy, the relative positions they will assume when activated by the muscles and nerves that belong to them." Some of the investigators who actually developed new articulators freely acknowledged their limitations. In 1920 Rupert E. Hall[19] published an article with the lengthy, but accurate title of "Movements of the Mandible and Approximate Mechanical Imitation of These Movements for the Arrangement and Grinding of Artificial Teeth for the Efficient Restoration of Lost Masticatory Function in Edentulous Cases." Who can take issue with this definition? But today we are using articulators, not only for full dentures, but also with the avowed purpose of treating and even of preventing periodontal disease and temporomandibular joint disturbances. We are thus facing the danger of becoming so intrigued with the ingenious devices that we have created, that we may tend to rely upon them to do our thinking for us. Such dependence must hinder the ability to observe our patients carefully as individual human beings, among whom variation in structure and function is the rule. All observations must, of course, be examined in the light of modern biological science. But, without accurate clinical observations, even science cannot help.

One should not imply that the pioneers in full denture work, from Bonwill onward, did not make any accurate observations and that their contributions were of no value. The early workers were primarily astute clinicians. For what more difficult task is there in dentistry than full denture prosthesis? With his artificial dentures, the patient expects to function not only as well as he did with his natural teeth, but even better. And the fact that so many patients actually realize their expectations is due, in no small part, to our rich heritage of experience, including the use of articulators.

There can be little question of the value of an articulator in the treatment of the edentulous patient. To create functioning artificial dentures some knowledge as to mandibular posture and movement is indispensable, and the increasing complexity of articulators are but attempts to create a mechanical device capable of reproducing the mandibular movements of the patient. At the present time the hinge-axis is looked upon by many as the basic reading. But in the hinge-axis, Max Pleasure[20] astutely observes, are we not asking the patient to function like an articulator? The fact is that when a patient presents himself without any occluding teeth, we must start somewhere, and no matter whether we use

Fig. 1. Visualizing the area of the occlusal interference while listening for it.

the hinge-axis, the gothic arch tracing, or any of the various methods advocated, we are still seeking to establish what our professional ancestors called the "central bite."[18]

Today one no longer refers to the central bite, but, among other things, centric, true centric, and centric relation. It can be defined in various ways. But it is a long step from naming and defining centric or its equivalent term to locating it on the patient. The fact that there are so many methods for obtaining this position is perhaps the best admission of the difficulties. Still another method which evolved during investigations of temporomandibular joint syndromes can be considered.

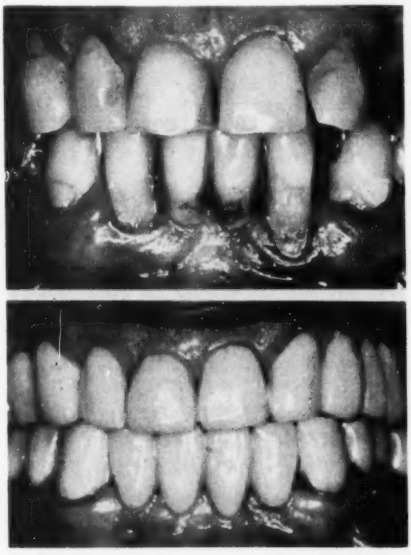

Fig. 2. Before and after photographs of a patient in whom painful spasm of the masseter muscle appeared soon after the completion of restorative treatment. a. Before treatment. b. After treatment.

THE USE OF STETHOSCOPY

During the clinical examination of patients suffering with temporomandibular joint syndromes, stethoscopy was used to determine the presence of clicking or crepitus in the temporomandibular joints and to relate these sounds to the various mandibular movements. With the use of medial auscultation, a clear click was heard at the end of the closing movement as the mandibular teeth struck those of the maxilla. In other patients, a dull thud was heard. When these patients were asked to open and close in relaxed rhythmical hinge-like manner, avoiding tight closure, a click was heard in all patients as the lower and upper teeth met. Patients were then asked to stop the closing movement at first light tooth contact. They were then asked to bite tightly. No sound was heard in some patients. In others, a grating "chalk on the blackboard" sound was heard. This sound, it was observed, was caused by occlusal interferences. With cheek retractors in place, most patients could easily locate the interference by pointing out the area of first tooth contact (Fig. 1). The direction of mandibular displacement, accompanying light to tight closure would reveal which cuspal inclines were responsible. Anterior displacement was usually caused by a distal incline of a lower buccal cusp and posterior displacement by a mesial incline. In the same way, the buccal or lingual inclines of a lower buccal cusp were usually responsible for lateral displacement. In those cases in which anterior teeth act as interferences, their detection is facilitated by the ease of visibility as well as the simpler anatomy of the front teeth.

Stethoscopy was found to be a useful adjunct in the diagnosis and treatment of occlusal interferences. With the patient holding the cheek retractors the operator places the thumb of one hand on the chin while holding the bell of the stethoscope over the temporomandibular joint with the other. He can thus listen and feel while he observes. An advantage of auscultation lies in the fact that it is possible to listen before attempting to feel or see. Too early manipulation of the mouth or jaws by the dentist often causes reflex movements, defensive in nature, which make the detection of interferences difficult. Through stethoscopy, it

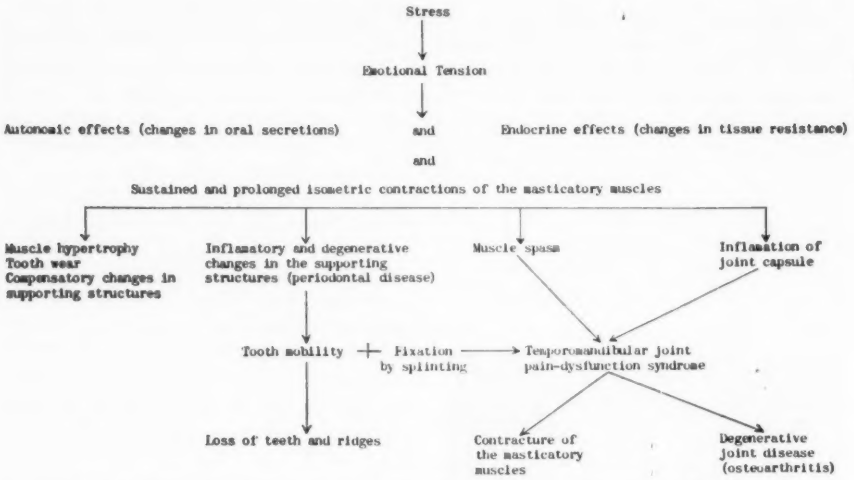

Fig. 3. Hypothesis as to the relationship between oral "habits" and disorders.

is possible to determine the presence or absence of occlusal interferences without touching the jaws, looking in the mouth, or taking wax cheek-bites. The actual location of the interference may require that these be done. But it was found that a first approach through stethoscopy served to facilitate the subsequent steps. This was especially true in the case of tense, highly reactive patients.

The use of auscultation was also found useful in treatment. During the selective grinding of cusps, for example, the sensitivity of the stethoscope proved its value. The slightest remaining interference would produce a typical grating sound during tight closure. The elimination of this sound confirmed the elimination of occlusal interferences. While there is much room for disagreement as to whether occlusal interferences should be eliminated routinely in the natural dentition of the patient suffering from periodontal disease, this procedure may be considered if the interferences are believed to be further injuring the already weakened supporting structures. It goes without saying that such alteration of the occlusal surfaces by grinding is concerned with but one factor in the disease process. Hence, one must be on guard so that attention to the occlusion of the teeth does not blot out a consideration of other factors usually more important.

Investigations emphasize the fact that the use to which the patient puts his mouth may be as important as its structure. Among patients suffering from temporo-

Fig. 4a. The maximal mandibular opening of which the patient is capable.

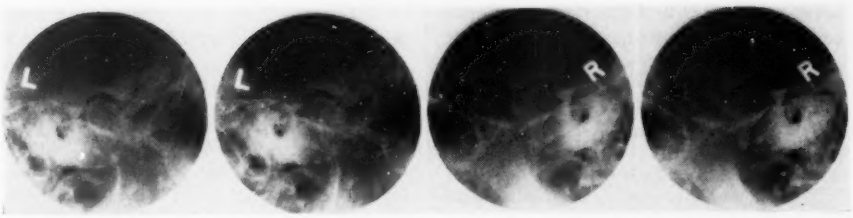

Fig. 4b. Radiographs of the temporomandibular joints of patient shown in 4a. Limited mandibular opening due to contracture. Note the complete absence of translatory movement in the right joint and but slight movement in the left.

mandibular joint syndromes there was found a prevalence of what is now called bruxism, but which is more accurately described as subconscious tensional oral function. The relationship of such activity to periodontal disease, described by Karolyi[21] in 1901, has been confirmed by recent psychiatric studies.[9] The fact that but few of the patients with temporomandibular joint syndromes had signs of periodontal disease, such as loss of alveolar support with tooth mobility, led to a consideration of a possible relationship. The relationship became clarified by the reaction of some patients, following so-called mouth rehabilitation. It was observed that in patients with periodontal disease, treated with full coverage and multiple splinting, the stabilization of the mobile teeth was followed by painful spasm of the masticatory muscles (Fig. 2). In time the following hypothesis was evolved (Fig. 3).

A HYPOTHESIS AS TO RELATIONSHIP BETWEEN ORAL "HABITS" AND ORAL DISORDERS

Some patients react to stress, among other ways, through subconscious oral function. Such function is characterized, in the main, by sustained isometric contractions of the masticatory muscles for prolonged periods. Such function depending

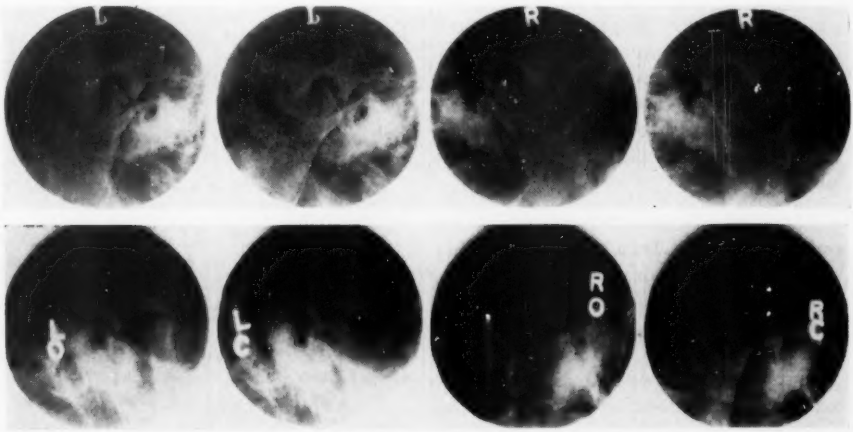

Fig. 5. Radiographs showing changes associated with osteoarthritis of the temporomandibular joint.

Top—Note marginal sclerosis of left condylar head.

Bottom—Note flattening of left condylar head.

upon various other factors, including the constitutional, may have the following consequences:

1. Changes accompanying the wear of the incisal and occlusal surfaces of the teeth.

2. Degenerative changes of the supporting structures (periodontal disease).

3. Temporomandibular joint pain-dysfunction syndromes. These may disappear spontaneously or continue in the form of a self-perpetuating pain-spasm cycle.

4. This cycle may lead to contracture of the masticatory muscles (Fig. 4) and/or degenerative changes in the temporomandibular joints (osteoarthritis) (Fig. 5).

APPLICATIONS IN THE MANAGEMENT OF PERIODONTAL DISEASE

This hypothesis has been found useful in evaluating patients for periodontal treatment. It helps integrate the facts obtained by means of a careful history and complete examination. In this evaluation the dimension of time is considered. As a result, the important question—"What result can I expect in this case?" will be followed by the equally important question—"What are the factors responsible for the conditions which I now see?" Palpating muscles and joints, determining the range and character of mandibular movements, x-ray examination of the temporomandibular joints and listening to joint sounds can tell much about the use to which the patient puts his mouth.

The hypothesis offered for consideration and trial has been found useful in coping with what is probably the key question, namely, "Will this patient be able to maintain the gains achieved through periodontal treatment?" For can we dare hope that a patient who because of clenching or gnashing has loosened teeth or injured muscles and joints will suddenly stop doing this because we have treated these structures?

In my opinion, in treating the occlusion of the teeth of the patient suffering from periodontal disease an adaptable patient is more important than the most adaptable articulator. But as important is the flexibility of the practitioner. We should see in addition to the oral anatomy and pathology of the patient the physiological and psychological processes at work. To these processes we should be willing and able to subordinate our technical procedures. If, after careful observation, seasoned thought, and flawless technic, the result of our efforts do not meet our expectations, they still have not been wasted. After all, is not disease itself but a failing of nature?

By studying the mandibular dysfunction accompanying disorders of the temporomandibular joint we have gleaned some understanding of its function. By looking upon each new dental patient as a research problem we can gain much valuable information, not only of the particular phase of dentistry in which we are interested, but also of the more basic problems of the temporomandibular joint and occlusion. And we cannot avoid admitting that, in spite of all that has been written about occlusion and all that is known about anatomy, our knowledge of the clinical physiology of the masticatory system is meager indeed. It was Mark Twain who observed that: It ain't the things we don't know that get us into trouble. It's the things we are sure about that ain't so.—*2 East 54th Street (22)*

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THE EIGHTH ANNUAL BERKSHIRE CONFERENCE IN ORAL PATHOLOGY AND PERIODONTOLOGY

The Division of Graduate and Postgraduate Studies of Tufts University School of Dental Medicine will conduct the Eighth Annual Berkshire Conference in Oral Pathology and Periodontology at Eastover in Lenox, Mass., June 16-20, 1957. The Conference will consist of four days of lectures, seminars, and panel discussions regarding the clinical problems by outstanding teachers and clinicians in dentistry, medicine and their related fields.

The curriculum is arranged so that mornings and evenings are devoted to professional activities with afternoons open for recreation. This is a conference for general practitioners as well as those interested in a specialized practice.

The Central Theme of the Conference will be the "Attainment of Optimal Occlusion in the Management of Periodontal Disease."

Included amongst the faculty and subjects to be considered are:

Bernier, Joseph L., D.D.S., M.S. Subject—The effects of high speed and ultra-sonics on dental tissues.

Glickman, Irving, B.S., D.M.D. Subject—Some important aspects of the surgical management of periodontal pockets.

Margolis, Herbert I., D.M.D. Subject—The potentialities of the cephalogram as an aid in the analysis of functional abnormalities in the adult dentition.

Miller, I. Franklin, D.D.S., M.A. Subject—The use of intra-oral methods and transfer to the articulator for the detection of functional occlusal abborations in the natural dentition.

Schmidt, W. George, D.D.S. Subject—The extent to which occlusal equilibration can be utilized in the establishment of optimal function.

Weinmann, Joseph P., M.D. Subject—The effect of normal and abnormal function on the normal and diseased supporting dental tissues.

Wentz, Frank M., D.D.S., M.S., Ph.D. Subject—Effective technics for the treatment of periodontal pockets and related soft tissue problems.

Zegarelli, Edward V., A.B., M.S., D.D.S. Subject—Management of oral mucous membrane disease.

For further information and application write to: Eighth Annual Berkshire Conference, Tufts University Dental School, 136 Harrison Avenue, Boston 11, Massachusetts.

Repositioning and Increasing the Zone of Attached Gingiva

by ARNOLD A. ARIAUDO, B.S., D.D.S.,* AND HOWARD A. TYRRELL, B.S., D.D.S.,**
San Diego, California

IN the treatment of periodontal disease a difficult problem is encountered when the base of the pocket either approximates or lies apical to the mucogingival junction. The surgical elimination of such pockets by simple gingivectomies either removes all of the attached gingiva in the area or leaves such a narrow band of the attached gingiva that the normal protection usually afforded by this tissue is missing. This problem is not only encountered in the deep pockets but also is found in the case of shallow pockets where the attached gingiva is minimal in occluso-apical dimension.

The characteristics not evidenced by the alveolar mucosa but necessary to proper function of attached gingiva are:

1. Firm attachment to the tooth and alveolar bone.
2. Dense keratinized surface epithelium.
3. Dense collagenous connective tissue.
4. Long, slender connective tissue papillae.[1]

The necessity for the above is understood when we realize food passing over the tooth must be deflected by a resistant tissue.

The structural characteristics of the alveolar mucosa are such that it will not assume the functions of attached gingiva. The submucosa contains large amounts of elastic tissue which must move; this is necessarily so as its functions include the covering of attaching muscles surrounding the oral cavity.

Previously[2] a technique was described for the management of these cases. However, probable problems still existed after such treatment. These were "shelving," with insufficient attached gingiva present to permit corrective gingivoplasty, residual pockets at the area most distal to the incision and resultant narrow attached gingiva which hindered correct tooth brush massage.

A technique is presented that will

(1) increase the occluso-apical dimension of the attached gingiva,

(2) eliminate the entire pocket,

(3) aid in "reattachment" of intrabony pockets that often occur in these cases.

Four diagrams are presented showing: (1) normal gingival sulcus and relationship

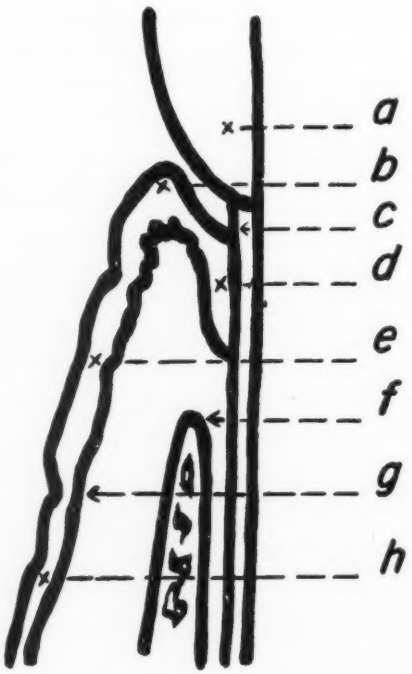

Fig. 1. Normal gingival sulcus and relationship of the attached gingiva to the muco-gingival junction. A—enamel, B—free gingiva, C—bottom of sulcus, D—epithelial attachment, E—attached gingiva, F—crest of alveolar bone, G—muco gingival junction, H—alveolar mucosa.

From the Department of Oral Pathology and Periodontics, School of Dentistry, University of Southern California.

*Associate Professor, School of Dentistry, University of Southern California.

**Instructor, School of Dentistry, University of Southern California.

of the attached gingiva to the muco-gingival junction; (2) a pocket with its base within the attached gingiva; (3) a deep pocket where the base is apical to the muco-gingival junction; and (4) a deep pocket where the base is apical to the muco-gingival junction with an intrabony pocket as a complicating factor. Often these intrabony pockets are overlooked in routine examinations of periodontal problems.

The technique advocated is as follows: Two vertical incisions are made beginning at the free gingival margin, passing through the attached gingiva and deep into the alveolar mucosa and terminating in the vestibule. These vertical incisions are mesial and distal to the pocket (Fig. 5). If two or more adjacent teeth present this problem it will be necessary to make a mesio-distal incision through the interdental papillae of the affected teeth (Fig. 6). This tissue is retracted with a periosteal elevator.

Now exposed to a better view of the operator are (1) local irritants such as calculus or marginal excesses of fillings, (2) root surfaces, (3) granulation tissue, (4) alveolar bone, (5) intrabony pockets which may exist, (6) crevicular side of the pre-existent pocket.

All local irritants must be removed, root surfaces planed and granulation tissue removed.

Generally not more than two millimeters of the free gingiva should now be excised

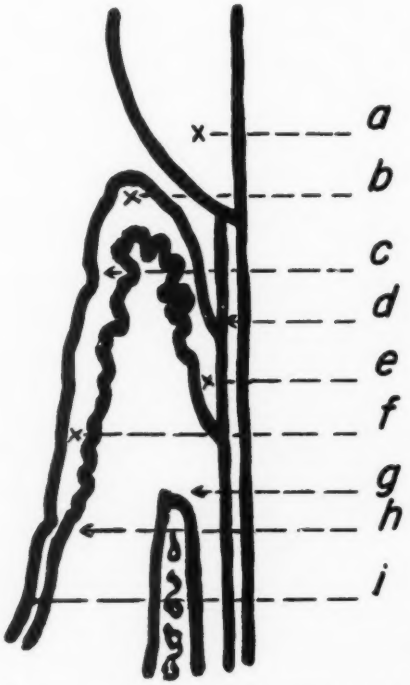

Fig. 2. A pocket with its base within the attached gingiva. A—enamel, B—free gingiva, C—free gingival groove, D—bottom of the pocket, E—epithelial attachment, F—attached gingiva, G—crest of alveolar bone, H—muco-gingival junction, I—oral mucosa.

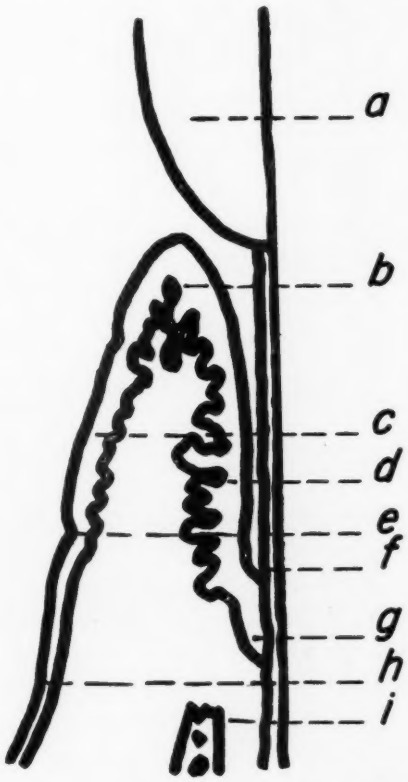

Fig. 3. A deep pocket where the base is apical to the muco-gingival junction. A—enamel, B—free gingiva, C—attached epithelium, D—crevicular epithelium, E—muco-gingival junction, F—bottom of pocket, G—epithelial attachment, H—alveolar mucosa, I—crest of alveolar bone.

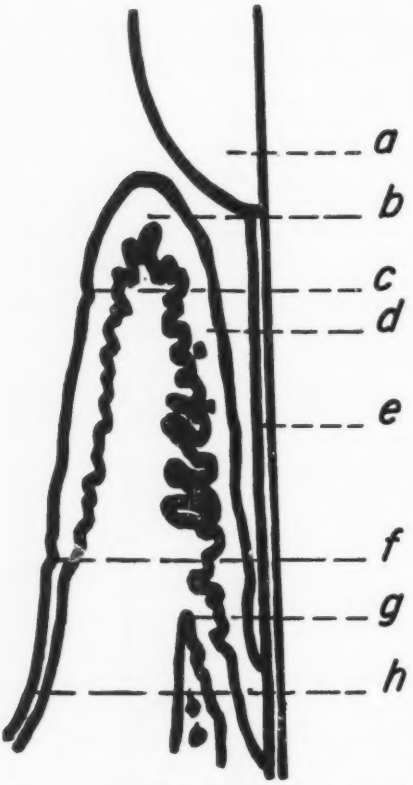

Fig. 4. A deep pocket where the base is apical to the muco-gingival junction and an intrabony pocket is a complicating factor. A—enamel, B—free gingiva, C—free gingival groove, D—crevicular epithelium, E—cementum, F—muco-gingival junction, G—alveolar crest, H—oral mucosa.

with a curved scissors and the crevicular epithelium of the pre-existent pocket removed by scraping with a Goldman-Fox or similar periodontal knife.

Bone that provides the lateral wall of intrabony pockets may or may not be removed, depending upon the judgment of the operator as to the possibilities of reattachment in the particular case being treated. It has been the experience of the authors that reattachment is often successful in such instances.

The flap is now returned to a position desired by the operator. Usually the occlusal edge of the flap is placed below the bottom of the pre-existent pocket. This generally leaves alveolar bone uncovered by tissue. The flap is held in the desired position by firm but gentle finger pressure until the bleeding ceases and the fibrin of the clot maintains the flap in the desired place.

After the bleeding has stopped, adhesive foil is placed, covering all margins of the flap and exposed bone. This will keep the pack from displacing the clot or dislodging the flap. Over the foil a periodontal pack is placed. Terramycin (or any brand of tetracycline Hydrochloride) should be incorporated into the pack (125 mg to 6 drops of liquid).[3]

The patient is placed on antibiotics of

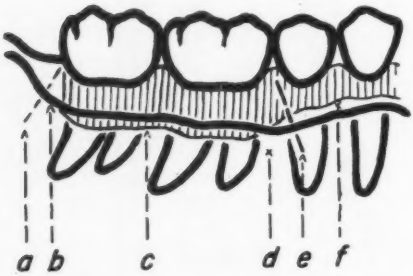

Fig. 5. Vertical incisions beginning at the free gingiva and terminating in the vestibule—shaded area indicates pocket depth. A—distal incision, B—muco-gingival junction, C—bottom of the pocket, D—alveolar mucosa, E—anterior incision, F—attached gingiva.

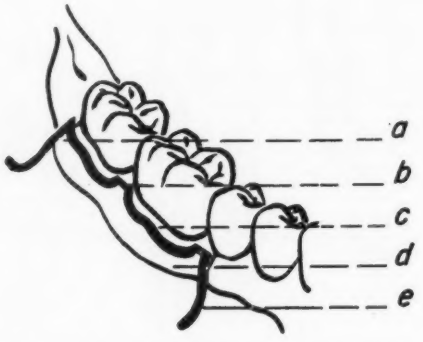

Fig. 6. Mesio-distal incision through the interdental papillae of two affected teeth. A—distal vertical incision, B—incised papilla, C—pocket area being retracted, D—flap, E—anterior vertical incision.

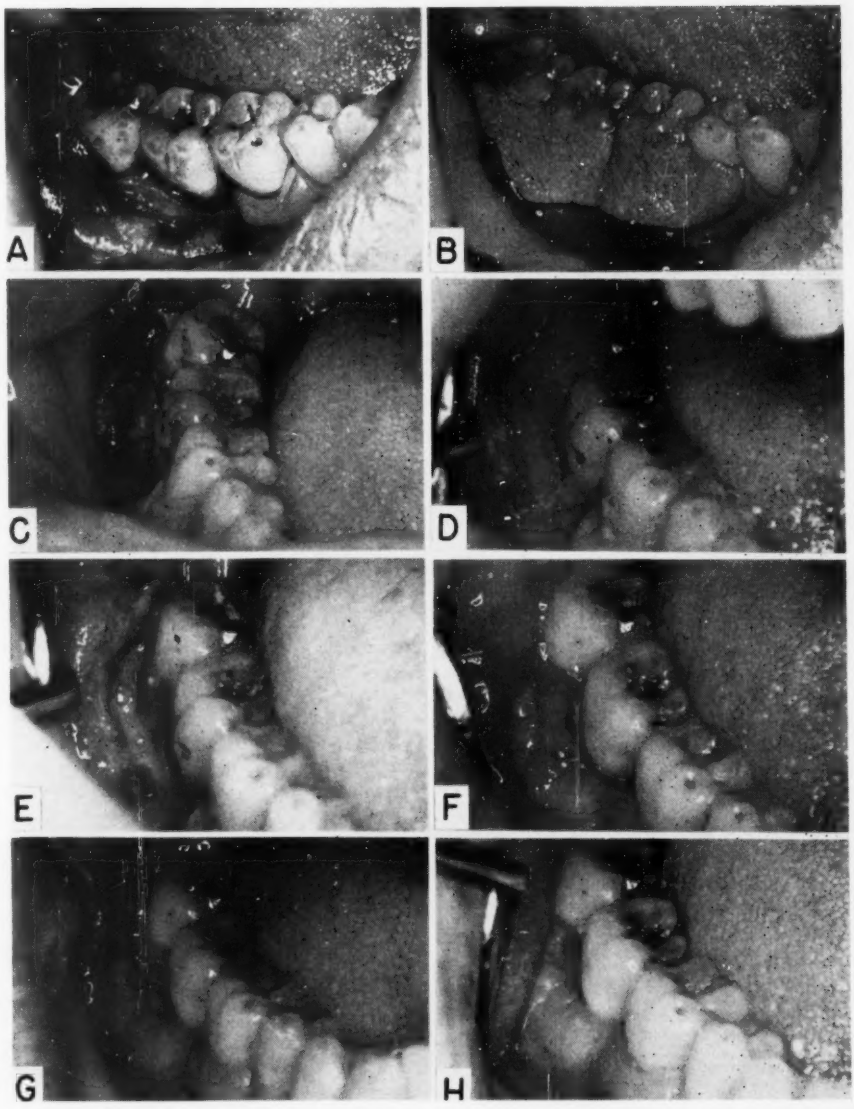

Fig. 7. (A) Illustration #1. Photo taken at the time of surgery. Notice the crest of bone that forms the lateral wall of an intrabony pocket. This was not recognized during the examination. Date 18 February 1955. (B) Illustration #2. Photo taken immediately after surgery. Notice compound used to cover the wound instead of adhesive foil. Periodontal pack with terramycin incorporated covers the compound. Date 18 February 1955. (C) Illustration #3. Pack removed at time of first post-operative treatment. Date 20 February 1955. (D) Illustration #4. Third post-operative appointment. Notice exposed bone and placement of attached gingiva. Granulation tissue is starting to cover the bone. Date 4 March 1955. (E) Illustration #5. Fourth post-operative appointment. Granulation tissue covering more and more bone, both adjacent to the teeth, and to the repositioned attached gingiva. Date 8 March 1955. (F) Illustration #6. Fifth post-operative appointment. Granulation tissue completely covers the bone, and this new covering will be attached gingiva. Notice the placement of the pre-operated attached gingiva. Date 15 March 1955. (G) Illustration #7. Sixth post-operative appointment. The repositioned attached gingiva and the new attached gingiva have increased the occluso-apical dimension as well as eliminated the previous pocket. Date 20 March 1955. (H) Illustration #8. Healed case with pocket eliminated and attached gingiva increased in occluso-apical dimension. Date 19 May 1955.

choice and reappointed every five days for post-operative care. It has been the experience of the authors that less post-operative discomfort is encountered if antibiotics are used. On the first post-operative appointment the pack and foil are removed and only pack is replaced.

It will be noted at this time that granulation tissue has begun to cover the exposed bone. This granulation tissue will gradually become attached gingiva. The new attached gingiva and the old attached gingiva which is still present at a more apical position, often double the original occluso-apical dimension of the tissue.

It is only appropriate at this time to discuss six problems which may occur with this approach.

1. Usually more post-operative pain is experienced by the patient for a longer period of time than with uncomplicated gingivectomies. However, if the packing is smooth and placed to act as a stent, the pain is not severe. Analgesics, or narcotics in rare instances, may be employed.

2. Post-operative appointments may continue over a period of three or four weeks, as it is necessary to maintain periodontal packs until epithelization is complete.

3. Sometimes the flap is displaced further apically than desired due to the action of the elastic fibers of the alveolar mucosa and the muscles surrounding the oral cavity. The operator's judgment dictates the possibility of suture placement to maintain the flap in its proper position.

4. Untoward morphology of the adjacent bone may be such that osteoplasty would be indicated. The access gained by the flap operation is such that osseous contouring can easily be accomplished by employing diamond stones, bone burs, bone files, or bone chisels.[4]

5. Should abnormal lingual tissue indicate a gingivectomy, it is recommended that the operation be performed concurrently with the procedure presented.

6. Poorly contoured gingival tissue sometimes results. The necessary corrective procedure is a gingivoplasty after covering of the bone and healing of the flap is complete.

For those who fear having uncovered bone in the mouth, it is comforting to know that maxillo-facial surgeons often leave one half to three quarters of an inch exposed in cleft palate operations, without untoward results.[5]

Figure 7 illustrates some steps of the operation and the results obtained.

SUMMARY

A technique has been presented which allows for retaining or increasing the occluso-apical dimension of the attached gingiva even though a periodontal pocket is present that extends apically to the muco-gingival junction.

This is done by a flap operation and repositioning of the attached gingiva to eliminate the pocket.

Problems often encountered are discussed.

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Gingivitis in Young Adult Males: Lack of Effectiveness of a Permissive Program of Toothbrushing

by MAURY MASSLER, D.D.S., M.S.,* HENRY M. ROSENBERG, D.D.S., WILLIAM CARTER, D.D.S., M.S.,** AND ISAAC SCHOUR, D.D.S., PH.D.,* *Chicago, Illinois*

THE relation of tooth cleanliness to gingivitis has often been stressed and demonstrated in individual cases. But few statistical studies have been made to determine objectively the relationship in larger groups. King (1945) examined the relationship of tartar deposits to gingivitis in the lower incisor and canine regions in 12-14 and 16-18 year old children and in 21-30 year old expectant mothers. The percentage of subjects with gingivitis was very high (80%-97%). He found that healthy gingivae could exist (in 9.7% of the cases) in the presence of tartar deposits but that the latter were more frequently associated with some degree of gingival disease. However, he did *not* find a strong cause and effect relationship and concluded that gingival inflammation may result in gingival débris as often as débris may cause inflammation.

Hine (1950) reported on a small group of dental students who brushed one side only, for two weeks. The majority showed no difference in the amount of accumulated débris or gingival inflammation between the brushed and unbrushed side. However, in one older patient, the unbrushed side showed marked accumulation of débris and gingival inflammation, after two weeks.

The effect of toothbrushing on gingivitis was evaluated statistically by McDonnell and Domalakes (1952) in 589 boys ages 10 to 18 years living in Boy's Town. These boys were subjected to an intensive and *carefully supervised* program of toothbrushing for a period of nine months. The authors assessed the gingivae before, during and after this program by the P-M-A index, as outlined by Massler, Schour and Chopra (1950). Color photographic records were not made. McDonnell and Domalakes (1952) were able to demonstrate a marked decrease in the amount of gingivitis after this intensive toothbrushing program, but stressed the facts that this group had an unusually high incidence of gingivitis initially, and that the toothbrushing regimen was very carefully supervised.

Van Huysen and Boyd (1952) used color photographs before and after toothbrushing to demonstrate the relative effectiveness of different dentifrices in preventing the return of stain on the dental enamel after 3 weeks of brushing. They reported no observations on the gingivae.

Chilton and Kutscher (1953) compared the relative effectiveness of a chlorophyll and a non-chlorophyll containing dentifrice in reducing gingivitis. Their evaluation was based on the clinical appearance of the gingivae, gingival sensitivity and hemorrhage incident to subgingival curettement and the patient's subjective evaluation. Neither the P-M-A index nor photographic records were used in their evaluation. The toothbrushing was not controlled and was left entirely to the patient's own wishes. They observed no difference between the effects of the chlorophyll and non-chlorophyll dentifrices and no effects of either type of dentifrice or toothbrushing in reducing the tendency to gingival sensitivity or hemorrhage. They observed no significant change in gingival appearance after 6 to 9 months of non-supervised, permissive toothbrushing.

The present study was designed primarily to observe the effects of a permissive, non-supervised program of toothbrushing on gingival inflammations, as well as on the cleanliness of the enamel and the gingivae, in a group of young adult males. Each subject was given a toothbrush and dentifrice plus a brief group demonstration of how to brush the teeth. They were then in-

*University of Illinois, College of Dentistry.

**Great Lakes Naval Training Center.

structed to brush their teeth every day, but the brushing was neither supervised nor checked in any fashion.

The evaluation of the effects of toothbrushing on the teeth and gingivae was made as objective as possible, by means of standardized color photographs taken of the anterior teeth and gingivae at 0, 10 and 15 weeks. The effects of the brushing on the cleanliness of the enamel and the inflammation of the gingivae were evaluated from these color photographs. In addition, a clinical examination and recording of the P-M-A values for each subject was made by one examiner, before each photograph was taken.

METHOD AND MATERIALS

The group consisted of 154 young adult healthy males, 17 to 22 years of age, who were recent inductees at the Great Lakes Naval Training Center. The group came from different areas of the East, Southeast and Midwestern states and represented a fairly good cross-section of the healthy young adult males of this country.

At the beginning of the study, each company was carefully examined and the P-M-A index of each man recorded by a single examiner (W.C.) on a standard form. Each man was given a toothbrush and dentifrice and instructed to brush his teeth regularly on arising and after each meal. The group as a whole was then given a single, brief demonstration on the technique of brushing. No further instruction or supervision was attempted.

Standardized color photographs were taken at the beginning of the program immediately following the initial examination, at the examination made 10 weeks later, and at the 15th week immediately before and within one half hour after cleaning the enamel with an engine driven rubber cup and abrasive, for a total of four serial photographs.

The color photographs were taken under standardized conditions. A 35 mm. camera with fixed focus was clamped in front of a plastic mouth prop and cheek retractor, also clamped to the table. Each subject was brought to the table, adjusted to the mouth prop and the shutter was tripped. Lighting and exposure were standardized. All films were stored in a deep freeze cabinet and developed at the same time by the Eastman Company.

Despite all these precautions, there were slight variations in the quality of some of the photographs. Nonetheless, the advantages of these photographs over clinical examination and the written records were apparent from the beginning. Perhaps their greatest value was to enable the examiner to critically and objectively evaluate the condition of the teeth and gingivae before and after toothbrushing in a manner not possible with the most detailed or quantitative record system yet available. One of the major conclusions of this study was that good color photographs are as important to the evaluation of gingival changes as good roentgenograms are for the evaluation of changes in the hard structures.

METHODS OF ASSESSMENT

Gingivitis: The gingival condition was assessed in vivo by the same examiner (W.C.) at the same time that the photographs were taken, using the method of P-M-A assessment as described by Massler, Schour and Chopra (1950). The same examiner later repeated his assessment of the anterior gingivae from the color photographs. A second and third examiner repeated the evaluation of the anterior gingivae from the color photographs. It was the consensus of the three examiners that the evaluation of the gingivae was made much more carefully and probably more accurately from the color photographs than by oral examination in vivo.

Changes in the teeth and gingivae after brushing for 10 and 15 weeks and after a superficial prophylaxis, were evaluated by placing the four color photographs taken of each subject side by side and comparing each area under 3x magnification. Details missed during the examination in vivo and

even overlooked during the re-evaluation of the P-M-A Index from the color photographs, were readily apparent by this method of *simultaneous examination and comparison of each picture in serial order under moderate enlargement.*

Tooth Cleanliness: Tooth cleanliness before and after toothbrushing was evaluated from the color photographs according to the following criteria:

I. No evidence of stain or film on labial or proximal areas of enamel.

II. A film or stain evident on labial and/or proximal areas of enamel. The stain or plaque varied from a diffuse pale brown to a sharp green line and from a thin line at the necks of the teeth to a diffuse covering of half the enamel surface. An accumulation of soft débris was not apparent in the photograph.

III. Accumulation of soft, cheezy débris (not calcified) at the cervical level on the labial or proximal surfaces, in addition to the stained film or plaque described above.

IV. Presence of calculus (supra- or sub-gingival) apparent in the photographs, in addition to stained plaques and soft débris.

In a few cases, etching of the cervical area of the enamel was also noted, in addition to the above. These were considered separately.

Each tooth was carefully examined in each of the photographs and the state of cleanliness recorded as I, II, III or IV.

The differences in cleanliness before and after toothbrushing were evaluated from a comparison of the photographs as being absent, slight, moderate or marked.

Types of Gingivitides: The gingivitides were divided into 3 categories according to (a) anatomic location, (b) distribution and (c) degree of inflammation.

Anatomic Location: A gingival unit was defined as consisting of the gingival papilla mesial to each tooth plus the marginal collar surrounding the labial aspect of that tooth and the attached gingivae covering the bone over the root of the tooth. The gingivitis was then described as occurring on the *papillary* (P) or *marginal* (M) or *attached* (A) portions of the gingivae or extending over all three anatomic locations.*

Distribution: The distribution of the gingivitis was also assessed as to whether it was localized to one or two dental areas or generalized to all anterior areas in the upper or lower arch or affecting both arches.

Degree of Inflammation: The severity of the inflammation in each area was assessed as follows:

0 = no gingivitis; clinically normal gingiva.

1+ = mild inflammation—slight change in color and little change in contour.

2+ = moderate inflammation — swelling obvious, glazing, redness (edematous) and chronic inflammation.

3+ = severe inflammation—more swelling and redness; possible pocket formations; degeneration.

FINDINGS

The incidence and amount of gingivitis in this group was significantly higher than in a comparable group of naval inductees examined in 1950 (Massler, Ludwick and Schour, reported in 1952) (Table I). It was also noted that the caries experience was much higher in this group than in the

*Papillary gingiva (P) That part of the free gingiva which fills the interproximal space between two adjacent teeth.

Marginal gingiva (M) The free gingival collar on the labial buccal, and lingual aspects of the teeth.

Attached gingiva (A) That part of the gingivae that is firmly attached to the underlying tooth and bone and stippled on the surface. The free gingiva is easily separated clinically from the attached gingiva.

TABLE I

Comparison of Gingivitis in Naval Inductees Examined in 1950 and 1954.

	(Years)	Examined	P	M	A	P+M+A
*1950	17–20	4,043	4.05	1.15	0	5.2
**1954	17–22	154	6.0	3.3	1.3	10.6

*Massler, Ludwick and Schour, 1952.
**Present study.

previous group. The higher caries experience was noted clinically by different dental examiners before this study was initiated.

The higher DMF and P-M-A rates (caries and gingivitis) seemed to be due to the fact that in 1950 careful screening of inductees was practiced, while the standards for dental health were much lower in 1954. There is the possibility, of course, that the examiners were more skillful or biased during the later examinations.

TOOTH CLEANLINESS AND EFFECTS OF PERMISSIVE TOOTHBRUSHING

Examination of the color photographs showed, in the majority of cases, no significant decrease in the amount of stain or soft débris around the necks of the teeth after 15 weeks of "toothbrushing." This was taken as evidence that these men failed to brush their teeth or did so infrequently and inadequately.

Thirty-two of the 154 men (20.8%) showed very clean enamel and no cervical débris in the first photographs, and in all subsequent photographs (Table II, Group I). It was inferred that these men brushed their teeth conscientiously before the program began and continued to do so during this investigation. It is possible also that some of these would show no deposits on the teeth even if they did not brush.

The bulk of the group (73 cases or 47.4%) showed evidence of a stained film and/or plaque (but little or no soft débris) on the necks of teeth in the first photographs (Group II). The majority in this subgroup (58 out of 71) showed no visible change in the cleanliness of the teeth from photograph #1 to photographs #2 or 3. Thirteen (17.8%) showing improved cleanliness of the enamel after 10 to 15 weeks of permissive toothbrushing (Table II).

Thirty-six of the 154 subjects (23.3%) showed accumulations of soft débris at the necks of the teeth at the first examination (Group III). Twenty-five (69.5% of this group) showed little or no change after 15 weeks. Eleven (30.5%) showed improved cleanliness of enamel and a decrease in cervical débris (Table II).

A few (13 subjects or 8.4%) showed gross evidence of neglect in the form of calculus, soft débris and stained enamel at the first examination (Group IV). In seven cases there was no change in the cleanliness of the teeth (or the character of the associated gingivitis) from the first to the fifteenth week. In 3 cases, the enamel was cleaner and there was less débris after 15 weeks of toothbrushing. In the other 3 cases, the follow up photographs were very poor or lost.*

Of the total of 154 men, only 27 or 17.5% showed improved cleanliness of the enamel and/or less cervical débris after 15 weeks of permissive toothbrushing. However, in 10 instances the difference was so slight that it could be detected only by

*Two additional cases in this group developed a necrotic gingivitis during this period and received treatment. They were therefore omitted from the evaluation of the effects of toothbrushing.

TABLE II

Distribution of Tooth Cleanliness in 154 Young Adult Males and the Effects of a Permissive "Toothbrushing" Program.

Group	*Description*	*Number of cases (and Percent)*	*Number (and Percent) Improved after 15 weeks*	*Degree of Improvement*		
				Slight	*Moderate*	*Marked*
I	Enamel surface very clean	32 (20.8%)	—			
II	Enamel stained slightly. No cervical débris	73 (47.4%)	13 (17.8%)	6	7	0
III	Enamel definitely stained. Soft débris around necks of teeth	36 (23.3%)	11 (30.5%)	2	7	2
IV	Gross débris and calculus visible. Enamel markedly stained.	13 (8.5%)	3 (23.1%)	2	0	1
	Total	154 (100%)	27 (17.5%)	10	14	3
				Significant improvement in only 17 cases (11.0%)		

the comparative photographs. Clinically (or when the photographs were examined in sequence instead of side by side) no changes were recorded. After 15 weeks of "toothbrushing" these ten still had dirty teeth and cervical débris, but to a slightly less degree than at the beginning of the program. In 14 other cases (9%) the improvement in cleanliness was definite but not marked. Cervical débris was significantly less evident although the enamel did not show less staining. In only 3 cases (1.9%) could a marked change in the cleanliness of the enamel and in the amount of cervical débris be noted. Two of these were in Group III and one in Group IV (Table II).

It was therefore concluded that the toothbrush was used to a significantly greater extent or more effectively by only 17 men (11.0%). An additional 10 men (6.5%) used the toothbrush a little more effectively but not significantly so.

DISTRIBUTION OF GINGIVITIDES

No gingivitis (normal gingivae) was observed in 33 of the 154 men (21.4%) (Table III, Group A).

In 52 cases (33.1%), the gingivitis was confined to the papillary area alone (Group B). In 39 cases the papillary gingivitis was mild, in 13 it was considered to be moderate and in none of this group was the gingivitis rated as being severe. In only 7 cases was the gingivitis localized to one or two papillae. In all the other, the gingi-

vitis was generalized in the upper or lower arch, or was present in both arches (Table III).

In 30 cases (19.4%), the gingivitis extended from the papillary area into the free marginal (labial) gingivae (Group C). In all cases, the distribution was generalized. No cases of localized gingivitis was observed in this group. In 17 cases, the gingivitis was rated as being generalized but mild; in 12 it was rated as moderate and in only one was the gingivitis considered to be severe (Table III).

In 32 cases (20.7%), the inflammation

TABLE III

Distribution of Gingivitis and Effects of Permissive "Toothbrushing"

Group	*Anatomic Location No. Cases and (%)*	*Distribution*	*Severity*	*No.(%) Cases*	*Improvement after "Toothbrushing" Number of cases with improvement*		
					1+ *Slight*	2+ *Moderate*	3+ *Marked*
A	No gingivitis	(normal gingivae)		33 (21.4%)			
B	Papillary Gingivitis 52 Persons (33.1%)	Localized	mild	6			
			moderate	1			
			severe	0			
		Generalized	mild	33	1	2	
			moderate	12		3	
			severe	0			
C	Papillary and Marginal Gingivitis 30 Persons (19.4%)	Localized		0			
		Generalized	mild	17	1		
			moderate	12	1	1	
			severe	1		1	
D	Papillary Marginal and Attached Gingivitis 32 Persons (20.7%)	Localized		0			
		Generalized	mild	8			1
			moderate	19	1	3	
			severe	5			
E	Gingivitis Marginal only 7 Persons (4.5%)	Localized	mild	3			
		Generalized	mild	3			
			moderate	1			
			severe	0			
	121 (78.5%)			154 (100%)	4	10	1
					15 (9.7%)		

TABLE IV

Distribution of Cases with Different Degrees of Gingivitis According to Location.

Distribution	*Severity of Inflammation*			*Total*
	Mild	*Moderate*	*Severe*	
Localized to 1–3 ant. papillae or margins	10	1	0	11 (7.1%)
All upper ant. gingivae affected	3	1	1	5 (3.2%)
All lower ant. gingivae affected	20	10	1	31 (20.1%)
All lower and upper ant. gingivae affected	37	33	4	74 (48.0%)
Total (all locations)	70 (45.4%)	45 (29.2%)	6 (3.8%)	121 (78.5%)
				Total=154 (No gingivitis in 21.4%)

was observed to infiltrate from the free gingivae (papillary or marginal) into the attached gingivae (Group D). All were generalized. In 27 cases, the infiltration was slight and had escaped detection during the clinical assessment but were evident in the photographs, after careful scrutiny. Eight were rated as mild and 19 as moderate from the photographs. Only 5 were rated as severe and had been noted clinically.

Marginal gingivitis alone (labial free gingivae inflamed without papillary involvement) occurred rarely, in 7 or 4.5% of the cases (Group E). In 6 cases the inflammation was rated as mild and in only one as being moderate. Three cases were localized to one or two areas, and mild. Four cases were generalized, one of which was rated as moderately inflamed.

From the above it is evident that only 21.4% of these young adult males had clinically normal gingivae. One-third showed mild papillary gingivitis, 20% showed moderate papillary and mild marginal gingivitis while a surprisingly large number (20%) showed infiltrations into the attached gingivae. It should be emphasized that the attached gingivitis was not noted during clinical examination but was evident in the color photographs.

Upper and Lower Arches: Most of the gingivitides were generalized and occurred in both the upper and lower arches (74 cases or 48%) (Table IV). In 31 cases (20.1%) the gingivitis was confined to the lower arch alone while in only 5 cases (3.2%) were the gingivitides found in the upper arch alone (Table IV). Localization of the gingivitis to only one or two areas was infrequent (11 cases or 7.1%).

Conclusions: In this group of 154 young adult males the pattern of attack by gingivitis tended to be generalized and distributed in both upper and lower arches (48%) or in the lower arch alone (20.1%). Localization occurred only infrequently (7.1%) and were mild papillary or mild marginal alone. Twenty-one per cent were

TABLE V

Average P–M–A Scores Before and After Permissive Toothbrushing as Judged From Color Photographs

Group	No.*	Before Brushing			After "Brushing" for 15 weeks		
		P	M	A	P	M	A
I Clean Teeth	28	2.4	0.3	0.1 (2.8)	2.3	0.2	0.1 (2.6)
II Film or Plaque Present	62	4.1	1.8	0.8 (6.7)	4.1	1.7	0.8 (6.6)
III Soft Débris Present	28	6.8	5.2	1.1 (13.1)	6.5	4.9	1.1 (12.5)
IV Calculus Present	0	11.0	11.2	4.9 (27.1)	11.0	11.1	4.5 (26.6)
Total	127	5.8	4.4	1.9 (12.1)	5.8	4.3	1.8 (11.9)

*27 cases omitted because of inadequate photographs or lost records.

free of gingivitis (Table IV).

In most cases, the gingivitis was confined to the papillae (52 cases), but a significant number extended into the marginal (30 cases) and attached (32 cases) gingivae (Table III). The majority of the inflammations were mild (70 cases) or moderate (45 cases) in degree, only 6 cases being rated as severe (Table IV).

IMPROVEMENT IN GINGIVITIS AFTER TOOTHBRUSHING

Changes in the ginvival picture after 15 weeks of permissive "toothbrushing" was not observed in the majority of cases. This is to be expected since, as has been shown, the majority did not actually increase or improve the toothbrushing as evidenced by the lack of change in the cleanliness of the enamel and the failure to remove soft cervical débris.

Fifteen cases (9.7%) showed a reduction in gingivitis after 15 weeks of permissive toothbrushing. A slight reduction in gingivitis was observed in 4 cases, a moderate reduction in 10 cases and a marked reduction in only one case (Table III). The last had a mild attached gingivitis at the beginning of the program.

The average P-M-A score for the total group of 127 men* was 5.8—4.4—1.9 (12.1) at the beginning of the program and 5.8—4.3—1.8 (11.9) after 15 weeks of "toothbrushing" (Table IV). This difference is not significant for the group. The improvement in gingivitis was confined to only 15 cases (11.8% of the population).

Relation of Gingivitis to Tooth Cleanliness: The severity of the gingivitis and the degree of cleanliness in each case was analyzed at the beginning of the program in order to determine whether any relationship existed between these two factors (Table VI). It was found that, in general there was a tendency for those with clean teeth to show less gingivitis than those with dirty teeth. Only one case with moderate gingivitis was observed to have very clean teeth. The coefficient of association (Yule) between teeth cleanliness and gingivitis was high (C = 0.558) (Table VI).

Relation of Improvement in Tooth Cleanliness to Improvement in Gingivitis: Twenty-seven cases showed improved oral hygiene as evidenced by improved cleanliness of enamel and cervical débris after 15 weeks of "toothbrushing" while 15 cases

*27 cases omitted because of inadequate photographs or lost records.

showed a decrease in gingivitis during the same period (Table VII A and B). The relation between these two groups and the effects of the improved cleanliness on the gingivae is shown in Table VII C.

Table VII A shows that the majority of cases (17 out of 27) with improved oral hygiene had, at the beginning of the study, a mild papillary gingivitis. A few (7 cases) had a papillary and marginal gingivitis.

Table VII B shows that the majority of the cases (10 out of 15) who showed an improvement in the gingival condition had stained enamel (Group II) or soft débris (Group III) around the necks of the teeth at the beginning of the program.

However, Table VII C reveals that only 7 cases were common to both groups i.e. only 7 cases showed better oral hygiene and concomitant decrease in gingivitis. Twenty cases showing improved oral hygiene but no change in gingivitis. Eight cases showed improved gingivae, but no improvement in tooth cleanliness. It was therefore concluded that, the improvement in gingival condition was related in improved cleanliness in only 7 out of 15 cases and that improved oral hygiene was related to improved gingivae in only 7 out of 27 cases.

This means that out of 154 cases only 23 cases improved their oral hygiene. Of these, only 7 showed concomitant improvement in the gingivae. Fifteen cases showed improved gingivae, but only 7 of these showed concomitant improvement in oral hygiene. The 8 other cases of improved gingivae were obviously not related to improved oral hygiene.

CERVICAL ETCHING

Cervical etching of the enamel was noted in eight subjects (5.1%). Two of these subjects showed perfectly clean enamel, three showed slight discoloration of the enamel, one showed a slight amount of cervical débris and two showed evidence of gross débris and discoloration of enamel (Table VIII). It was therefore concluded that etching of the enamel was not necessarily related to staining of the enamel or

TABLE VI

Relation of Gingivitis to Tooth Cleanliness in 154 Young Adult Males.

		*Gingivitis***				
		0	1+	2+	3+	Total
Cleanliness* of Enamel	I	16	15	1	0	32
	II	16	33	15	9	73
	III	1	11	11	13	36
	IV	0	0	3	10	13
	Total	33	59	30	32	154

*I—Enamel perfectly clean.
II—Slight staining of enamel.
III—Staining of enamel plus soft débris.
IV—Gross débris and calculus.

**0—No gingivitis.
1+—Mild papillary or marginal gingivitis.
2+—Moderate papillary gingivitis plus marginal involvement.
3+—Severe gingivitis (attached gingival affected).

$C = 0.558$
(Maximum possible = 0.866)

$$C = \sqrt{\frac{S - N}{S}}$$

$$S = N\Sigma\left(\frac{Nrc^2}{Nr \cdot Nc}\right)$$

cervical débris.

Two of these cases showed no gingivitis, one showed a very mild papillary gingivitis (not related to the etched area), 2 showed moderate marginal gingivitis and 3 showed a severe papillary, marginal and even attached gingivitis. It was therefore concluded that cervical etching of the enamel was not necessarily related to marginal gingivitis.

DISCUSSION

Toothbrushing: This study indicates that giving a toothbrush and dentifrice to young adult males does not insure effective use of these implements—even when these adults are under a military regimen where motivation by example and by orders might be expected to operate. It seems that habits of oral hygiene are instituted at an earlier age level and are continued thereafter. Only 20.8% of these men brushed their

TABLE VII

Relation of Improved Oral Hygiene to Gingival Improvement.

A) 27 Cases with Improved Cleanliness

Gingivitis at Beginning of Program	1+	2+	3+	
0	1	1		
1+	5	11	1	
2+	3	4		
3+	1			
	9	16	1	27

B) 15 Cases with Improved Gingivae

Cleanliness at Beginning of Program	1+	2+	3+	
I	1			
II	1	5		
III	1	5	1	
IV	1			
	4	10	1	15

C) Correlation Between Improved Cleanliness and Improved Gingivae

		No Change	*Improved Cleanliness* 1+	2+	3+	
No Change		127 / 139	10	10		20 Cleanliness improved; Gingivitis not improved
Improved Gingivitis	1+	3		1		7 Cleanliness improved; Gingivitis improved
	2+	5		5		
	3+				1	
		8 Gingivitis improved; Cleanliness not improved	7 Gingivitis improved; Cleanliness improved			15 / 27

teeth effectively as judged by the cleanliness of the enamel at the first examination. Those who did not brush their teeth at the beginning of the program, continued their habits during this investigation as evidenced by the absence of change after 15 weeks.

It is evident that a permissive program of toothbrushing is not effective. Studies on the effects of toothbrushing must first of all insure effective and demonstrable toothbrushing. Color photographs of the enamel before and after toothbrushing are essential evidence in the evaluation of toothbrushing and the effects of toothbrushing. These photographs must be of good quality and show good detail.

Tooth Cleanliness: Tooth cleanliness is probably the result of many factors: the natural detergent action of foods and saliva, the efficiency of the masticatory apparatus, the presence of malocclusion and areas of food impaction, habits of chewing plus the artificial cleansing action of the toothbrush (which includes the manner in which it is used, time and force of use as well as the dentifrice used).

In this study it was assumed that the changes (or non-changes) in dental cleanliness was related only to the toothbrushing. This is probably an over simplification of the problem but is a necessary one. The fact that these men lived in barracks and presumably ate a similar diet tends support to this view.

Relation of Toothbrushing to Gingivitis: These data tend to show a relation between oral hygiene (as measured by the cleanliness of the teeth and gingivae) and gingivitis. This relationship is, in general, a strong one ($C = 0.558$) but occasional contradictions do exist (Table VI).

However, in the 27 cases who improved their oral hygiene (presumably by more frequent or more efficient toothbrushing) only 7 showed concomitant improvement in gingival conditions. As Lyons (1949) points out, "many of the statements and clinical observations as to the beneficial effects of toothbrushing on the gingivae represent opinions and not scientific proved fact." It is entirely possible that brushing the teeth (and the gingivae) when subgingival calculus still remains does *not* benefit the gingival tissues and in fact may further irritate them. A controlled study in which toothbrushing is performed efficiently and before and after a thorough prophylaxis, would answer some perplexing questions in regard to periodontal therapy.

Attached Gingivitis: A significantly higher incidence of marginal and attached gingivitis was noted in this group. The striking difference was in the much larger number of cases in which it was noted that the chronic inflammatory process had infiltrated into the attached gingivae.

It was the opinion of the examiners that the increase in attached gingivitis was probably the result of the availability of photographs which could be re-examined and studied carefully under magnification.

Use of Kodachrome Records: This study impressed upon these investigators the necessity of obtaining good color photographs of the teeth and the gingivae as objective and analyzable records whereby the changes on the enamel and in the gingivae could be evaluated correctly. We agree with Van Huysen and Boyd (1952) that such records are essential to accurate and objective evaluation of the effects of toothbrushing on the enamel and gingivae. Visual examination and written records, no matter how carefully and honestly these were kept, could be very misleading due to unconscious bias. During the course of the study, the clinical impression by two of the responsible investigators was that these men did brush their teeth and did show better oral hygiene. However, the color photographs failed to substantiate this impression. In fact, the clinical impression was reversed by the same investigators after review of the photographs.

When serial photographs are available for direct comparison, judgment tends to be more accurate, more objective and more

TABLE VIII

Distribution of 8 Cases with Cervical Etching of the Enamel in Relation to Tooth Cleanliness and Gingivitis.

		*Severity of Gingivitis***				
		0	1+	2+	3+	
	I	1		1		2
Cleanliness*	II	1	1		1	3
of Enamel	III			1		1
	IV				2	2
		2	1	2	3	8

*I—Enamel perfectly clean.
II—Slight staining of enamel.
III—Staining of enamel plus soft débris.
IV—Gross débris and calculus.

**0—No gingivitis.
1+—Mild papillary or marginal gingivitis.
2+—Moderate papillary gingivitis plus marginal involvement.
3+—Severe gingivitis (attached gingivae affected).

conservative. Visual memory is unreliable and often misleading while written records are subject to bias.

Furthermore, serial photographs permit evaluation of the evidence (and the data) by two separate investigators and in this manner render the observations more objective, conservative and free of personal bias.

This study indicates that good serial color photographs are essential for correct and objective evaluation of changes in the enamel or gingivae following therapeutic procedures such as toothbrushing, application of drugs or vitamin therapy. For example, the commonly accepted principle that massage or scaling of teeth results in marked improvement in gingival conditions has, to our knowledge, not been subjected to objective serial evaluation. The effects of astringents on gingival enlargement has similarly been accepted on an empirical clinical basis, but not yet demonstrated objectively.

It is concluded that the study of the effects of various therapeutic agents on the gingivae without well controlled serial color photographs (and biopsies!) is liable to bias.

P-M-A Index: This study also demonstrated the value, as well as the limitations, of using the P-M-A index alone for the

TABLE IX

Average P–M–A Values of 127 Young Adult Males Before and After a Permissive Program of "Toothbrushing."

Examiner	*Material Examined*	*Before Brushing*	*After Brushing*
W.C.	In Vivo	5.9 — 7.7 — 0 (13.6)	4.1 — 5.7 — 0 (9.8)
W.C.	From Photos	5.9 — 5.4 — 0 (11.3)	5.4 — 5.3 — 0 (10.7)
H.R.	From Photos	5.8 — 4.4 — 1.9 (12.1)	5.8 — 4.3 — 1.8 (11.9)

evaluation of *changes* in the gingivae following therapeutic procedures.

It was made clear by previous studies and by the present study that the *estimation* of the amount of gingival inflammation in a large population group, can be made accurately and quickly by means of the P-M-A index (Table IX). One examiner (W.C.) recorded his findings in vivo and checked his own findings by a blind re-examination of the photographs. The averages obtained matched fairly well. A second examiner (H.R.) checked the first by means of the photographs. The averages obtained by both examiners from the photographs were fairly close (Table IX).

Table IX illustrates the fact that *changes* in gingival condition can be recorded accurately from the color photographs by means of the P-M-A index. The first examiner (W.C.), recording his observations in vivo, observed a drop in the index from 13.6 to 9.8 after toothbrushing. This difference, while considerable (28%), was not statistically significant. Re-evaluation from the color photographs by the same examiner changed these figures from 11.0 before brushing to 10.7 P + M + A after brushing. This re-evaluation was confirmed by the second examiner (H.R.) who showed a small (and insignificant) change from 12.1 to 11.9 P + M + A units affected, in the color photographs.

We therefore conclude that the P-M-A Index is a valuable and fairly accurate method of evaluating the amount of gingivitis in large population groups examined in vivo but is liable to bias. It is more accurate when used on good color photographs and checked by two different examiners.

A P-M-A assessment on a single individual, in vivo, represents an estimate of the amount and distribution of gingivitis based on a single examination. A P-M-A assessment of a color photograph, on the other hand, can be the result of a series of careful observations. Most important, the assessment can be checked by repeated observation by one or many investigators so that the P-M-A index represents a statistical enumeration of an observed condition. There is no doubt that serial color photographs are a much more objective and accurate method of recording *changes* in gingival conditions. *When the P-M-A index is used as a supplement to the color photographs, an accurate quantitative evaluation of such changes can be made (Table IX).*

SUMMARY AND CONCLUSIONS

The effects of a permissive (non-controlled) program of toothbrushing was evaluated in a group of 154 Naval Inductees (males 17 to 22 years of age). Each man was given a toothbrush and dentifrice and instructed to brush his teeth on arising and after each meal. No further checks or attempts to control the brushing were attempted. The effects were studied by means of clinical evaluation and standardized color photographs taken at 0, 10 and 15 weeks. The analysis was quantitated by rating the cleanliness of the enamel (clean enamel, enamel stained, presence of soft débris and presence of gross débris and calculus), by scoring the gingivitis as mild, moderate and severe; papillary, marginal and attached; localized or generalized and by using the P-M-A index to assess the amount of gingivitis as observed clinically (by one examiner) and in the color photographs (by 2 examiners).

In contrast to the opinion expressed by Hiniker and Forscher (1954), it was felt that the rating of cleanliness and gingivitis was more exact and objective when made from the color photos than when attempted in vivo.

It was found that after 15 weeks of permissive (non-controlled) toothbrushing:

1. Only 17.5% of the subjects showed improved cleanliness of the enamel and gingivae which were demonstrable in the color photographs. It was therefore concluded that young adult males did not significantly

alter their brushing habits when given a toothbrush and dentifrice and instructed to brush their teeth.

2. Only 9.7% showed objective visual evidence of improved gingivae after the 15 weeks period.

3. Only 7 of the 27 cases with improved oral hygiene showed improved gingivae, while only 7 of the 15 cases with improved gingivae showed also improved hygiene. It was therefore concluded that improved toothbrushing does not, per se, always result in improved gingivae. Limiting factors may be the presence of calculus or crowding of the teeth.

It is felt that good color photographs taken before and after any therapeutic procedure are essential to the accurate and objective evaluation of the effects of such procedures on the enamel or gingivae. The P-M-A index is valuable in quantitating the amount of gingivitis or the amount of change in gingivitis especially when used in conjunction with good color photographs.

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Plan to attend

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Cementum and Dentine Implants in a Dog and a Rhesus Monkey

by ERWIN M. SCHAFFER, D.D.S., M.S.D.,* *Minneapolis, Minnesota*

BUEBE[1] was the first to advocate the use of bone powder in treating infrabony pockets. The source of the powder was the compact layer of a long bone from a cow. He writes, "The bone powder provides mineral salts and other essentials for bone healing. If the powder was not implanted into the radiolucent area, fibrous healing might result, because of insufficient availability of calcium salts from the neighboring tissues." The sterile bone powder is bound with fibrin foam.[2]

In his investigation of experimental reattachment in the Rhesus monkey, Ramfjord reported that fragments of cementum and dentine were incorporated between the periodontal fibers and new cementum appeared to be deposited on these displaced parts of the root.[3] These fragments remained in the area after the reattachment procedures.

Schaffer and Zander[4] described the histologic findings of healed human periodontal pockets that were treated by a new attachment operation. In this study, cementum and dentine particles from final root planing were frequently seen in the healed tissue away from the teeth. A pink staining matrix was seen surrounding these particles. The staining quality was the same as the new cementum (cementoid) on the roots and the new bone (osteoid). It was evident that this matrix was osteoid, and osteoblasts were aligned on its surface indicating active bone apposition. It appeared that these particles or shavings from root curettage stimulated osteogenesis. Occasionally, entire new trabeculae were formed with the cementum or dentine particles as a nidus.

From the preceding study and Ramfjord's investigation, the question arose whether the stimulation of osteogenesis by cementum and dentine particles was accidental or coincidental. However, upon finding new bone matrix around cementum and dentine particles in healing periodontal pockets in monkeys,[5] it could be inferred that it was not an accident or a coincidence. Therefore, it incited further investigation into the effects of cementum and dentine in healing wounds. The following series of studies were completed and the results are reported.

PROCEDURES IN THE DOG

Two lower central incisor teeth were extracted in a dog. After the adherent tissues on the roots of these teeth were removed completely, a dental bur was used to make shavings of the cementum and the dentine. These particles were collected on a sterile plate and implanted in the extraction wounds. In one of the extraction wounds, three large pieces of tooth were embedded. Some of the particles were placed deep in the wounds and others superficially. A periodontal pack was placed over the wounds attempting to protect them. The pack remained only two days; nevertheless, the wounds healed rapidly and uneventfully.

In the same dog and on the same day, a flap was raised between a lower left premolar and molar, exposing the underlying bone. A bur was used to remove some of the bone and the attachment mesial to the molar, simulating a vertical type of bone loss. Before the flap was replaced and sutured, many small shavings and one large piece of tooth were placed in this surgical pocket. No attempt was made to protect the area with a periodontal pack.

The dog was sacrificed sixty-four days later and the mandible was fixed in ten per cent formalin, decalcified with five per cent nitric acid, embedded in celloidin, sectioned, and stained with hematoxylin and eosin.

*Clinical Associate Professor, Division of Periodontology, University of Minnesota.

PROCEDURES IN THE MONKEY

In a Rhesus monkey, cementum and dentine shavings from human teeth were implanted after flaps were raised and some of the bone and attachment was removed in two interdental areas.

In the area between the upper left premolar and the molar, the bone was removed at an angle to simulate vertical bone loss. The particles implanted were from the extracted teeth of a human sixty-three years old, and they were obtained in the following manner. After the teeth were extracted and the soft tissues were scraped from the roots, they were placed in penicillin and streptomycin for a day. As determined by incubation, this did not sterilize the teeth. Therefore, they were autoclaved and were found to be sterile. With a dental bur, tooth particles were removed from the teeth and collected in a sterile petri dish. Before implanting the dentine and cementum particles, they were kept dry for one day.

The flap was sutured and a periodontal pack (Box's formula with fifty milligrams of terramycin) was placed over the area. A metal splint covering the pack was removed by the monkey on the tenth day.

Fourteen days after the preceding operation, cementum and dentine particles were implanted between the lower left premolar and molar of the above monkey. The particles placed in the infrabony area were from the same teeth and patient as in the preceding implant. These autoclaved particles were kept sterile and dry for fifteen days prior to the implant. The same technique was used as described above. The periodontal pack and the cast splint remained for fourteen days until it was removed. Both of the implants healed uneventfully and without complications.

Upon sacrificing the monkey, the healing periods of the implants were fourteen and twenty-eight days. The mandible was removed and fixed in ten per cent formalin, decalcified in five per cent nitric acid, embedded in celloidin, sectioned, and stained with hematoxylin and eosin.

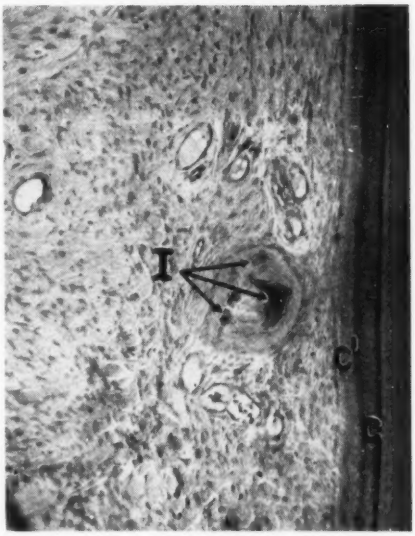

Fig. 1. In an extraction wound of a dog, the implants (I) are surrounded by new bone which has osteoblasts on its surface. Cementoblasts are present on the surface of the new cementum (C^n) that has formed on the old cementum (C^o).

RESULTS IN THE DOG

Implants in the extraction wound: Around many of the cementum and dentine implants in the healed extraction wounds, new bone was formed. The new bone could be easily distinguished from the tooth particles by its different staining qualities (Fig. 1). Osteoblasts were aligned on the surface of the bone matrix, and occasionally osteocytes were present in the matrix. The newly formed bone varied in amount and position on the particles. Some of the particles were completely surrounded by bone, and others were only partly covered with osteoid on only one or two surfaces. In some cases the new bone was wide, and in others narrow. There was no discernible correlation between the size of the particles and the degree of osteogenic activity around them. The osteogenesis was

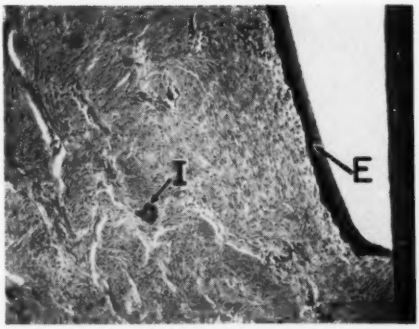

Fig. 2. The implants (I) in the connective tissue near the crevicular epithelium (E) do not have any osteoid on their surfaces. There is a relative absence of inflammatory infiltrate.

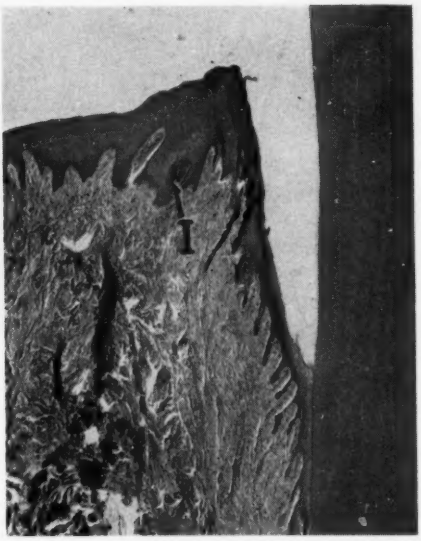

Fig. 3. A dentine and cementum implant (I) surrounded by the oral epithelium of the dog. Cellular infiltration is not prominent in the connective tissue adjacent to the epithelium.

manifest not only around the implants in the deepest parts of the healed extraction wounds, but also in the connective tissue above the alveolar process.

A few particles were seen without any new bone on their surfaces; but in these instances, there was no inflammatory infiltrate near or around them (Fig. 2).

A small particle lying within the epithelium of the oral mucosa did not have any new bone on its surface (Fig. 3). One of the large pieces of tooth was implanted very near the surface of the extraction wound. In healing, some of the oral epithelium grew down and covered about one third of this implant. New bone was not found on the portion of the particle where the epithelium covered the implant. However, the portion beyond the epithelium and not covered by it had new bone on its surface, and osteoblasts lined the surface of the matrix indicating active bone apposition.

Some resorption was observed on a few surfaces of the large pieces of implanted tooth, but not on the small pieces. While multinucleated cells were observed in resorption areas on one side of the implant, osteoid was present on the other side. Osteoclasts were present on the surface of some bone trabeculae, while osteoblasts were on the adjacent surface of new bone matrix formed on an implant. The surface of bone with osteoclasts on it and the surface of the new bone with osteoblasts were adjacent and very close with very little connective tissue between (Fig. 4).

Implants in the surgical area: The cementum and dentine particles, in the area prepared by removing part of the attachment and alveolar bone, stimulated new bone formation. However, there was a significant difference between the osteogenic activity around the particles in the extraction wounds and the ones in the surgical pocket. The difference was less osteogenic activity in the implants in the latter area than in the extraction wounds. This was attributed to the severe inflammation adjacent to calculus and bacterial plaques, which accumulated on the root some time after the implant. A periodontal pocket had formed, and the epithelium in this area was apical to the cemento-enamel junction. Although this was true, there was new bone around a few of the particles.

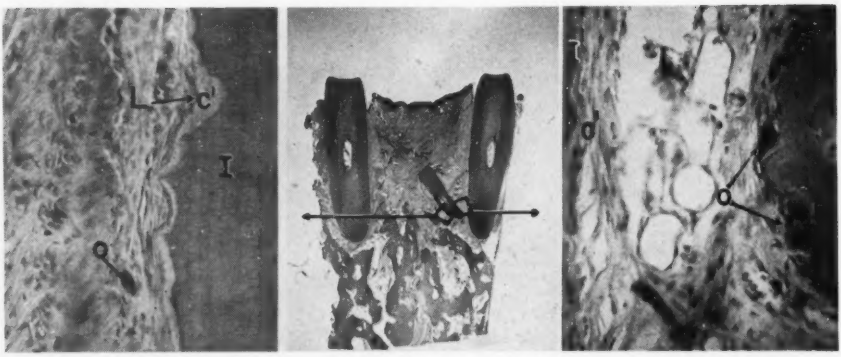

Fig. 4. Large dentine implant (I) in the extraction wound of the dog. New cementum (C') has formed on the surface and in resorption areas of the implant. Collagen fibers were embedded in it and some cementoblasts were present. Osteoclasts (O) are present in some resorption areas of the new bone.

RESULTS IN THE MONKEY

Fourteen day implant: The cementum and dentine particles could be seen readily in the new connective tissue. Many of the particles had new bone or osteoid on some of their surfaces and osteoblasts were present on the surfaces of the matrix, indicating active bone apposition. Although some of the particles did not manifest active bone apposition on their surfaces, the connective tissue around some of them appeared to be very dense and rather hyalinized. Some of the implants were completely surrounded by bone that formed new trabeculae (Fig. 5). The lack of round cell infiltration near or around the particles indicated that the implants did not act as foreign bodies. There was no resorption of the surface of these numerous small implants (Fig. 5). However, there was some osteoclastic activity at a moderate distance from the implants. The osteoclasts appeared to be associated with a normal reconstruction of bone.

A few tooth particles that were implanted near the cemento-enamel junction were lying in the epithelium of the gingival margin. There was no bone apposition on these implants.

The epithelial attachment was at the cemento-enamel junction. The interdental papilla was slightly eroded, and the connective tissue in the area was moderately infiltrated with lymphocytes. This cellular infiltration was a moderate distance from the implants.

Twenty-eight day implant: New bone

Fig. 5. Fourteen day implants in the monkey. Implants (I) have osteoid or immature bone (B'') on their surfaces. New bony trabeculae (B') extend from some of the implants. The mature bone (B) was old bone that was present prior to the implant procedures.

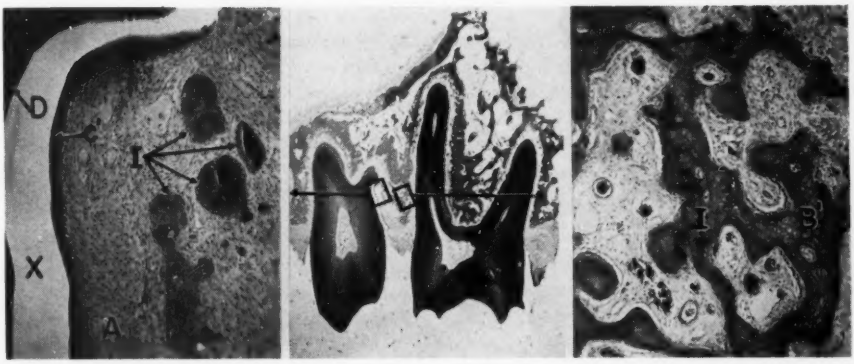

Fig. 6. The cementum and some of the dentine was removed in this twenty-eight day implant. Many cementum and dentine implants (I) are present with new bone (B^1) on and around them. An artifact (X) is present between the new cementum (C^1) and the dentine (D). Cementoblasts were present on the cementum matrix and new collagen fibers are embedded in it forming a new periodontal membrane. The epithelial attachment (A) was coronal to the new cementum.

was deposited on one or more surfaces of most of the cementum and dentine implants. Frequently, the particles were entirely surrounded by new bone. Around the implants, the new bone formed either isolated islands or entire new trabeculae (Fig. 6 and 7). Some osteoclasts were seen on the surface of a few trabeculae. There was no cellular infiltration around any of the implants. A few of the particles were implanted very near the surface of the pocket. Usually, when this occurred, the oral or crevicular epithelium covered the particle partly or totally, and there was no osteogenesis.

New cementum was present on the root surface with cementoblasts on its surface. Connective tissue fibers were embedded in the cementoid on one side and in osteoid on the other side. Thus, a new periodontal membrane was formed (Fig. 6). Coronal to the new cementum was the epithelial attachment, which was at different depths in the various sections. Sometimes it was at the cemento-enamel junction, and other times it extended for some distance on the root.

DISCUSSION

Osteogenesis was stimulated by both cementum and dentine implants, and there was no apparent difference in the amount and speed of bone apposition around these two types of implants. There was more osteogenesis in the extraction wounds than in the area prepared by removing part of the bone and attachments of a tooth in the dog. The difference can be attributed to

Fig. 7. High magnification from the twenty-eight day specimen, the implants (I) are completely surrounded by bone. Some osteoblasts (L) are present.

the severe inflammation adjacent to pocket epithelium. The inflammation was caused by the calculus and bacterial plaque in the pocket area. The inflammation was not a foreign body reaction to the implants because the particles from the same teeth of the dog were used in the extraction wounds, and there was no cellular infiltrate around them.

Bone apposition was observed not only in resorption areas on the larger implants, but also directly on the surface of the smaller implants without any previous resorption by cementoclasts. Resorption associated with multinucleated cells was present on some surfaces of the large implants, but it was absent on the surfaces of the small and medium sized particles in the dog. Because of the lack of these multinucleated cells on the surfaces of the small and medium sized particles in the dog, and all the particles in the monkey, it was assumed that these multinucleated cells were associated with the internal reconstruction of bone. This was also inferred from bone apposition on one surface and resorption of tooth substance on another surface of the same implant. It was also indicated by the proximity of osteoclasts on the surface of a new bone trabeculae and osteoblasts on the surface of the new bone matrix on a large implant. Some old resorption areas were also seen on the surface of some of the larger implants.

Osteogenesis was manifest not only around the autogenous implants in the dog, but also around the heterogenous implants in the monkey. The new bone around the heterogenous implants was the most interesting because they were particles from human teeth that were autoclaved and kept dry before implanting them. There was no cellular infiltrate around any of the implants in the monkey. New bone was seen in both the fourteen and twenty-eight day implants. After only fourteen days of healing new osteoid had formed, and some of it had tooth particles in or near the center. This finding of new bone apposition on the tooth particles in the fourteen day implant was two days earlier than reported by Linghorne and O'Connell in their grafts.[6]

New cementum had been formed on the root surface of the twenty-eight day implant in the monkey; and on the surface of the cementoid were cementoblasts, which were indicative of active apposition. New connective tissue fibers, embedded in the new cementoid and bone matrix, formed a new periodontal membrane.

In the fourteen day implant in the monkey, the necrotic epithelium in the interdental papilla was not attributed to the implanted particles because there was not any inflammation around them. This was true whether they were implanted deep or superficially. However, if they were implanted near the surface, the oral or crevicular epithelium surrounded them as in the twenty-eight day implant. The necrotic papilla might be attributed to the disturbed blood supply which followed the flap procedure. This seems to be the most plausible explanation because the interdental papilla in the twenty-eight day implant was not necrotic. If the healing period of this latter implant had not been as long, it too might have been necrotic. The necrosis was not caused by calculus or bacterial plaques on the roots because they were absent.

From this material, it would seem that small implants are more effective in stimulating osteogenesis than larger ones. This opinion is based upon the lack of resorption in these implants and the direct apposition of bone on them. However, in the larger implants, resorption areas were seen with multinucleated cells on their surfaces. One might assume that whenever possible, tooth particles should be left in the healing area in a new attachment procedure, provided they are free from calculus and any other plaques either mucinous or bacterial. Hence, after all the calculus and plaques are removed from the root with a pull stroke, a push stroke is employed to plane the root. In this technique, some of the tooth shav-

ings will remain in the clotting blood. Consequently, they will stimulate osteogenesis by acting as a nidus for new bone apposition. The new bone may be islands or bony trabeculae.

SUMMARY

Autogeneous and heterogeneous cementum and dentine particles were implanted in a dog and a Rhesus monkey. The autogeneous implants were in two exraction wounds and in one surgically created periodontal pocket in the dog. The heterogeneous implants using tooth particles from human teeth were in two surgical periodontal pockets in the monkey. Prior to implanting, the particles from human teeth were autoclaved and kept dry in one implant for one day and in the other for fifteen days.

Osteogenesis occurred in all of the implants, but it was much less in the surgical periodontal pocket in the dog than in his extraction wounds or in the surgical pockets in the monkey. New bone matrix was present on the surface of both the cementum and dentine implants.

Small implants appeard to be more effective in stimulating osteogenic activity than larger implants because the bone apposition was directly on the surfaces of the smaller implants without previous resorption.

There was no evidence of resorption on the surface of the small or medium sized implants, but multinucleated cells were present on the surface or in the resorption areas of the large implants. This resorption appeared to be associated with the internal reconstruction of bone.

In the monkey, cementoid was formed on the root surface in which connective tissue fibers were embedded. On the other side of the new periodontal membrane, these fibers were embedded in osteoid which had been formed on and around the implants.

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NOTE

1957 Spring Conference of

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April 29, 30, May 1, Ann Arbor, Michigan

Histochemistry of Calculus Formation*

by Irwin D. Mandel, Barnet M. Levy, and Bernard H. Wasserman,
New York, New York

MOST of the studies of salivary calculus have been concerned with the chemistry, bacteriology, and histology of mature, fully calcified calculus.[1,2,3] Some investigators have studied the *in vitro* production of calculus on extracted teeth.[3,4] Others have investigated the chemical composition of saliva in relation to calculus formation. Numerous theories have been formulated, most of which have been reviewed by Hodge and Leung.[5]

Recently, Mandel and Levy[6] reported the results of investigations into the histochemistry of fully formed calculus. They pointed out the similarities between salivary calculus and other ectopic calcifications.

This paper reports the results of histological and histochemical investigations of early, developing dental calculus. To obtain the material for our studies, a technique was devised whereby strips of celluloid were placed around the necks of teeth. These strips could be removed at various time intervals for histological, histochemical and Grenz ray studies. Zander employed a comparable technique using a cellulose acetate film for studying the epithelial attachment.[7] Ennever, Robinson, and Kitchin used a removable celloidin block to study bacterial plaque.[8]

MATERIAL AND METHODS

Patients known to be "heavy calculus formers" were selected for this study. Celluloid strips approximately 70 micra thick were contoured to fit around the lower anterior teeth, covering the proximal and lingual surfaces from below the free margin of the gingiva to the middle of the crown of the tooth. The strips were held in place by a thin circumferential wire around the upper third of the strip (Figs. 1 and 2). The patients were instructed to practice their normal oral hygiene and as far as possible to ignore the presence of the strips.

The celluloid strips were removed at intervals varying from 3 to 29 days. Some were examined by soft X-ray (Grenz ray), using spectroscopic plate films at 5 KV with a 20 second exposure. The strips were fixed in either 10% neutral formalin or 95% ethanol, embedded in paraffin and serially sectioned at 5 to 7 micra. Sections were stained with hematoxylin and erythrocene, periodic acid-Schiff, 0.05% toluidine blue buffered at pH 5, von Kossa silver stain with and without counterstaining with safranine or toluidine blue, mucicarmine, Gram's stain, and malachite green.

Strips were removed from the mouth between 48 and 64 hours after insertion for the purpose of bacteriological examination of the precalcified plaque material. Direct smears were made and Gram stained. Material from the strips was inoculated into dextrose broth tubes and then transferred to a variety of culture media and incubated for 3 to 5 days both aerobically and anaerobically. Organisms thus isolated were studied in detail.

Fig. 1. Celluloid strips **in situ.** Strip around right central incisor has been stained for visualization.

One of the patients was the source of a number of strips which were sent to Dr. Robert Gorlin at the University of Minnesota for X-ray diffraction study. The calcified material was scraped from the strip, air dried, and ground with an agate mortar and pestle. The pictures were taken with a 19 cm. cylindrical camera, using both Fe K α and Cu K α radiation.

RESULTS

The diffraction patterns of the calcified material were found to be primarily apatite

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with a small amount of whitlockite. Examination of the diffraction pattern of supragingival calculus produced in the normal manner in the same individual showed the same composition.

A wide variety of organisms were isolated, including hemolytic Streptococcus viridans, Staphylococcus albus and aureus, Lactobacillus acidophilus and bifidus, monilias, and numerous branched and unbranched filaments.

There appear to be several varieties of filamentous organisms present in the precalcified matrix. Rough and smooth colonies of Actinomyces israeli were identified as well as pigmented colonies very

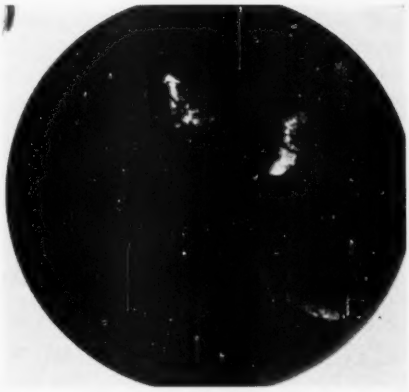

Fig. 3. Grenz ray of strips removed from mouth. Three day specimen (8 o'clock) was not radioopaque. Seven day (5 o'clock), 15 day (12 o'clock), and 29 day (2 o'clock) specimens are opaque with scattered radiolucent areas.

Fig. 2. Celluloid strip removed showing calcareous deposit.

similar to A. homins, Nocardia corallina, Nocardia rangoonensis, and Nocardia mesenterica.

Grenz ray examination of the strips which were maintained in patients' mouths for 3, 7, 15, and 29 days revealed no areas of calcification by the third day and a granular type of calcification on the seventh day. The 15- and 29-day-old celluloid strips showed a dense radioopacity with scattered areas of less dense material (Fig. 3).

Microscopic examination of sections of the 3- and 5-day specimens showed that the plaque attached to the strip consists of an amorphous and/or finely granular matrix in which there are masses of Gram positive and negative coccoid bacterial forms, as well as occasional filaments. The plaque is strongly Schiff positive, mucicarmine positive, and acidophilic. It exhibits metachromasia in some areas. Some of the 3-day specimens show considerable silver precipitation with the von Kossa staining reaction. Where the section is von Kossa positive, the silver is precipitated as small spherical granules, diffuse in some areas and densely compact in others (Figs. 4 and 5).

By the seventh day the character of the plaque appears to change. While the masses of coccoid forms are still obvious, the surface as well as the more central areas now

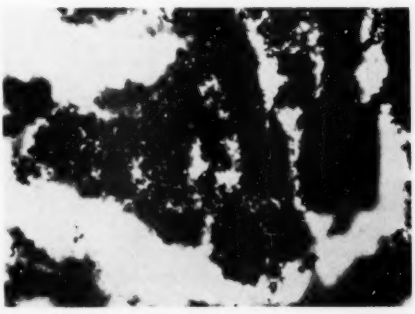

Fig. 4. von Kossa silver preparation of three day specimen showing small spherical granules of silver positive material.

contain masses of filamentous organisms. Studying alternate slides, we observe that those areas which are von Kossa positive are associated with the filamentous organisms as well as with the focal areas of coccoid forms.

By the 12th day the plaque is composed almost entirely of filamentous bacteria. These bacteria appear as irregularly staining twisted strands of branching and nonbranching filaments. They are strongly Schiff positive and Gram variable. The cytoplasm of the filaments is coarsely granular. Nonstaining areas occur. Since these areas do not stain with malachite green, they are probably vacuoles and not spores. The organisms are apparently embedded in a finely granular or amorphous ground substance which is mucicarmine positive in many areas. The threadlike bacteria stain an intense dark blue with toluidine blue, except for focal patches of metachromasia. The ground substance in these focal areas is also strongly metachromatic. In a general way the metachromatic areas correspond to the silver positive areas of alternate slides stained by von Kossa's method. However, within the metachromatic foci there are localized areas of orthochromasia in which a crystalloid structure can be seen.

In some of the islands of metachromasia the predominating bacterial form is coccoid. The cocci per se, however, do not exhibit metachromasia. Some of the islands of metachromasia are laminated by alternating deep and pale staining bands (Fig. 6). Treatment of the sections with versene for 5 - 15 minutes prior to staining with toluidine blue causes a diminution of metachromasia in the focal areas of calcification.

In the areas in which there is obvious calcification, the Schiff reaction, while positive, is much less intense than in the noncalcified areas (Fig. 7).

Although there was considerable variation in the time of onset of calcification, by the 14th day calcification had begun in all the strips examined. All sections of the strip material which had remained in the mouth 14 days or longer had a similar structure.

Fig. 5. von Kossa—toluidine blue preparation of a 5 day specimen. The darkening along the celluloid strip is metachromatic material. The blackening in the peripheral areas of the plaque is the densely compact von Kossa positive material.

By the 14th day, regardless of the amount of calcification present, lamination of the matrix is apparent. The laminations take the form of deeper staining irregular striations which follow the general contour of the surface of the plaque. This is espe-

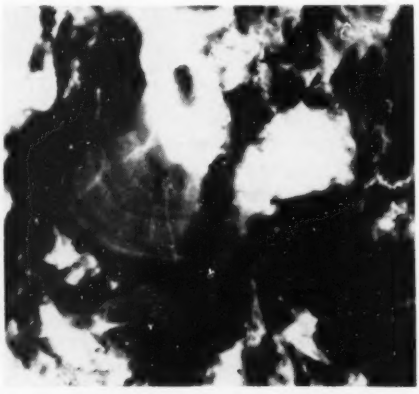

Fig. 6. Section of a 12 day specimen stained with toluidine blue demonstrating in the calcifying portion an area of metachromasia laminated by alternating deep and pale staining bands.

Fig. 7. Section of a 12 day specimen stained by the Schiff reaction demonstrating a loss of intensity of the stain in areas undergoing calcification.

cially true of the outermost stria.

In some sections (independent of length of time in the mouth) there appears to be an amorphous, nonstaining cuticularlike material present at the junction of the plaque and the celluloid strip. This cuticular material is also occasionally present at different levels within the plaque itself (Fig. 8).

DISCUSSION

Bacteriological examination of the precalcified matrix demonstrates the presence of a large variety of organisms. Our findings are similar to those of Bibby, Rosebury and others who worked with crushed, fully calcified calculus.[3, 9] It should be noted that some of the filamentous microorganisms could be identified as A. israeli, while others had characteristics similar to those reported for A. hominis and some types of pigmented Nocardia.

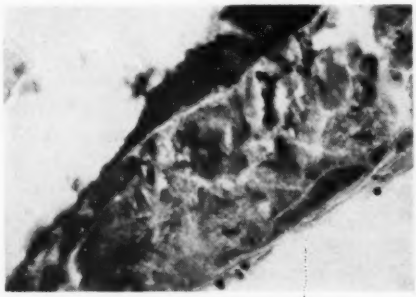

Fig. 8. Section of a 24 day specimen stained with toluidine blue demonstrating the presence of nonstaining cuticular material at the junction of the plaque and the celluloid strip. This cuticular material is also present at different levels within the plaque itself.

Despite considerable calcification of the material on the strips as evidenced by Grenz ray examination, we were able to prepare paraffin sections without prior decalcification. A study of these sections indicates that there is a bacterial plaque common to all the material we have studied on the strips, irrespective of the presence or absence of calcification. This plaque is also similar to the decalcified fully formed calculus reported in previous studies. With the exception of the very early specimens (3 to 5 days), all the calculus examined had similar morphological characteristics. The preponderance of coccoid forms rather than filaments in the early material raises the question of the mode of attachment of the calcifiable matrix or plaque to the strips or tooth surface. It appears from our study that attachment can take place in the absence of filamentous forms. Even when filamentous organisms are present, they are not always directly attached to the strips.

As can be seen in Figure 8, there frequently is a "cuticle" interposed between the strip and the plaque as well as between layers of microorganisms within the body of the plaque. One of the interesting questions that has arisen from this study is: what is the nature and origin of this cuticular material? Optically it resembles the cuticle seen over the surface of enamel and cementum. A similar cuticle was observed by Waerhaug on artificial crowns,[10] and by Zander on cellulose acetate strips used in his epithelial attachment work.[7] In view of our findings, the problem of calculus attachment should be more fully investigated.

The ground substance which envelops the organisms is more obvious in our material than in fully formed calculus. From the staining characteristics, it would appear that this material is some form of mucopolysaccharide, derived from either the saliva or the bacteria, or both. Microorgan-

isms have been reported to produce a mucopolysaccharide which is metachromatic to toluidine blue.[11] The presence of a mucoidal ground substance leads to interesting speculations as to its role in calcification. Boyce et al have implicated urinary mucoids in the formation of urinary calculi.[12, 13] They postulate that the mucoid chelates calcium and that this colloidal micelle acts as a nidus for crystallization of the calcium salt. A similar mechanism may be active in the calcification of salivary calculus.

Our studies with the von Kossa reaction indicate that there is considerable variation in the length of time the strips must remain in the mouth before calcification begins. Some strips show evidence of calcification as early as the third day, others not until the 14th day. This variation occurs not only with different individuals, but with different teeth of the same individual.

The ability to cut the strips with adherent calculus without prior decalcification affords the opportunity of studying some aspects of the calcification process. This process occurs in numerous individual foci. The change from bacterial plaque to calcifiable matrix in these focal areas is evidenced by a marked increase in metachromasia and a diminution in the intensity of the Schiff reaction. It should be noted, however, that there are local areas of orthochromasia within the metachromatic foci, and that these areas of orthochromasia sometimes contain crystalloid material. It may be, then, that the presence or absence of metachromasia in calcifying areas is dependent upon the calcium ion concentration. The relation of metachromasia to calcification has been reported by a number of investigators concerning a variety of calcifications.[13, 14, 15] The diminution in the intensity of the Schiff reaction in the area of calcification has recently been noted by Johnson and Bevelander in pulp stones.[16]

The lamination of the calcifying areas in salivary calculus is similar to that seen in pulp stones and urinary calculi. This may be due to the Liesegang Ring phenomenon.[17]

It appears that salivary calculus shares chemical, histochemical and structural properties with other ectopic calcifications. One mode of calcification may be common to all. The role of carbohydrate-protein complexes as part of the "local factor" determining calcifiability of a tissue is now under extensive investigation.[15] It should be noted that salivary calculus matrix, composed primarily of bacterial and salivary elements, is comparable in a number of respects to the more organized calcifications of bone and cartilage.

SUMMARY AND CONCLUSIONS

Calculus formation was studied by placing contoured celluloid strips around the lower anterior teeth of patients known to form calculus rapidly. Interposing the strip between the tooth and its environment allowed calcareous material to be deposited upon the strip instead of on the tooth. The strips with adherent material were removed at intervals of 2 to 29 days, fixed and sectioned without prior decalcification. A variety of stains and staining procedures were used, including the von Kossa reaction, the Schiff reaction, toluidine blue, and mucicarmine.

With the onset of calcification, there appears to be a partial loss of metachromasia and a marked diminution in the intensity of the Schiff reaction. The calcifying areas are frequently laminated by alternating dark and light staining bands producing a concentric ringlike appearance similar to that of pulp stones and urinary calculi. The structural and histochemical similarities between salivary calculus and other ectopic calcifications may indicate a common basic mechanism of calcification. The carbohydrate-protein complexes present in the matrices of calcifying tissues may be the common denominator.

The authors wish to thank Drs. Robert Gorlin and J. W. Gruner of the University of Minnesota for analyzing our material by means of X-ray diffraction.

We acknowledge with gratitude the technical assistance of Mrs. Pauline Shugaevsky and Miss Lois Chaimowitz.

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Book Review . . . .

PERIODONTAL THERAPY

By Henry M. Goldman, D.M.D., F.A.C.D., Samuel Schluger, D.D.S., and Lewis Fox, D.D.S., F.A.C.D. *565 pages with 190 text illustrations and 100 plates. Index. Price —$18.75. St. Louis. The C. V. Mosby Company, 1956.*

Periodontal Therapy admirably fulfills the need for a textbook on the treatment of periodontal disease. In the past there have been many good texts written covering both the basic theoretical principles and treatments of periodontal envolvements. Realizing the wide scope of therapy, the authors have purposely omitted the basic considerations and concentrated on treatment alone. This departure from the usual contents of a text on periodontia is a good one in this instance.

The book stresses the importance of an adequate diagnosis and prognosis before therapy is undertaken, and the first three chapters are devoted to this phase. Various scaling and curettage techniques are discussed later, followed by the surgical approaches. The chapters on surgical treatment are well covered and illustrated superbly. There are many photographs and plates illustrating the step by step techniques employed eliminating any question of the procedure.

This book could well serve the dental student, general practitioner or periodontist. If used as a text in a dental school, it would be desirable to have another text in conjunction with it covering the basic fundamentals and theories of periodontology.

Henry M. Swenson

Staining of Resin and Silicate Restorations By Topically Applied Solutions of Stannous Fluoride

by JUDITH F. HINE, MARJORIE L. SWARTZ, B.S., AND RALPH W. PHILLIPS, A.B.,* M.S.,
Indianapolis, Indiana

THE reduction in dental caries by the topical application of sodium and stannous fluoride has been established. The reaction occurring on the enamel surface has not as yet been determined. However, recent work by Brudevold[1] has indicated that there is an uptake of tin by the enamel during the topical application of stannous fluoride. He, and other investigators,[2,3] have suggested that some discoloration or staining of enamel might result from the reaction of tin with sulfides which might be present in the mouth. This phenomenon has not been proved by adequate laboratory or clinical investigation.

However, if such a reaction would occur, then a possibility does exist that discoloration of certain restorative materials might result from the topical application of stannous fluoride solutions. Such staining might occur either by tin absorption or precipitation on the surface or by deposition around the margins of the restoration. This problem was the basis for this investigation.

PROCEDURE

Discs, approximately 25 mm. in diameter, were prepared from one representative commercial silicate cement, S. S. White, and from 2 resin restorative materials, P. F. and Kadon. These 2 resins were selected because one, P. F., contains relatively large quantities of inorganic filler material while the other is an acrylic resin containing no filler.

The specified powder-liquid ratios were employed with all three materials and they were handled by the manufacturer's directions. The discs were covered with cocoa butter and later carefully finished with a fine grit sandpaper strip in order that the exposed surface would correspond to that of the clinical restoration. All discs were stored in a humidor at approximately 100 per cent humidity for 24 hours before being used. One-half of each disc was covered with "Scotch" brand electrical tape and the test solutions were then applied to the exposed half. Thus, it was possible to compare, on the same disc, the treated side with the untreated.

When sodium fluoride was employed, the discs were swabbed with an unbuffered 2 per cent aqueous sodium fluoride solution for a total of 4 four-minute periods.[4] Recent studies have suggested that a single 4-minute treatment with an 8 per cent unbuffered stannous fluoride is as effective as 4 four-minute applications of a 2 per cent stannous fluoride solution.[5] For this reason a single four-minute treatment of 8 per cent stannous fluoride was used.

In some tests discs of the various materials were also treated with an 8 per cent unbuffered solution of stannous chloride in order to better isolate the action of the stannous ion itself.

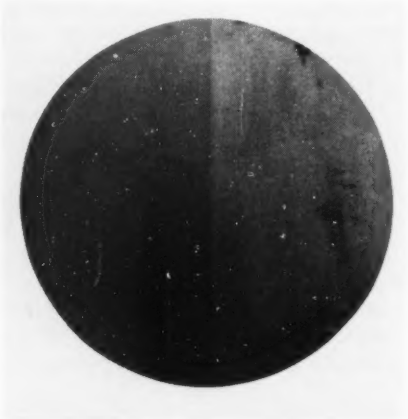

Fig. 1. Left side of silicate disc was treated with stannous fluoride. Dye reveals alteration on the surface.

To study stain at the marginal areas, class V restorations of resin and silicate were placed in the labial surfaces of extracted teeth. These teeth were central incisors stored in tap water immediately following extraction and maintained wet throughout the experiment. All restorations were made in accordance with accepted clinical procedures.

Methods used to detect the action of the solutions on the different materials, and on the restorations, included microscopic examination, staining with a dye (1 per cent aqueous neutral red) and exposure to solutions containing sodium sulfide. Some treated

*Indiana University School of Dentistry.

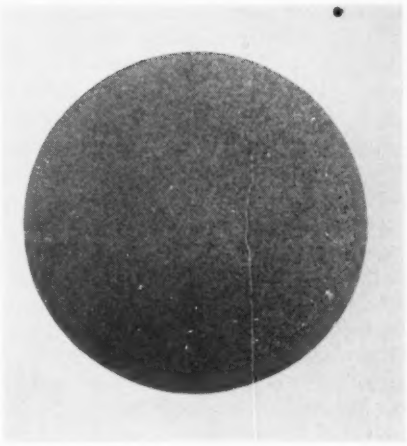

Fig. 2. Resin disc treated with stannous fluoride shows no change. (left half was treated)

discs and teeth were also stored for periods of time in synthetic saliva.

A minimum of 6 specimens were used for each individual test and the photographs used in this paper are representative of the results obtained.

RESULTS

Discs—Visual examination revealed that the topical application of stannous fluoride had a pronounced effect on the surface of the silicate discs. There was a tenacious white deposit on the treated area. No difference, however, was noted between the treated and untreated portions of the resin discs prepared from either of the two resins which were used.

There was no detectable change on the surfaces of either the resin or silicate discs to which a 2 per cent sodium fluoride solution had been applied. In order to reveal any surface phenomenon not readily visible, the discs were covered with the dye. They were thoroughly rinsed and dried before being examined. Silicate and resin discs treated with stannous fluoride appear in Figures 1 and 2, respectively. A deleterious effect can be seen on the surface of the silicate but no apparent alteration to the resin. The sodium fluoride solution produces no effect with any of the materials.

Although there was an apparent deposit on the silicate discs to which stannous fluoride had been applied, the pH of this solution is 2.6 and it was felt that part of the action might be simply due to etching from the acid solution. The unbuffered sodium fluoride solution at a pH of 6 did not alter the surface of the silicate. A 2 per cent sodium fluoride solution was adjusted to pH 2.5 with dilute hydrochloric acid and was applied topically to resin and silicate discs. Also resin and silicate discs were swabbed with pH 2.5 hydrochloric acid solution.

The resin discs were unaffected by either the sodium fluoride solution of low pH or by the hydrochloric acid. However, the surface of silicate discs, treated with hydrochloric acid and pH 2.5 sodium fluoride solutions were etched and a typical dye-treated specimen may be seen in Figure 3. Although the surfaces were etched, they were quite different in appearance from those treated with stannous fluoride—no deposit being evidenced.

To study further the possible staining action of stannous fluoride on silicate cement, discs which had been treated topically by stannous fluoride were thoroughly dried and then placed in a 0.5 per cent solution

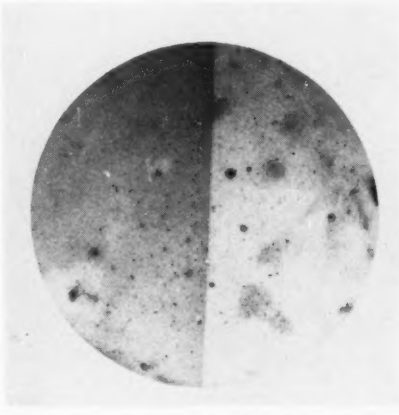

Fig. 3. Silicate swabbed with pH 2.5 sodium fluoride solution. Dye reveals etching on treated side at left.

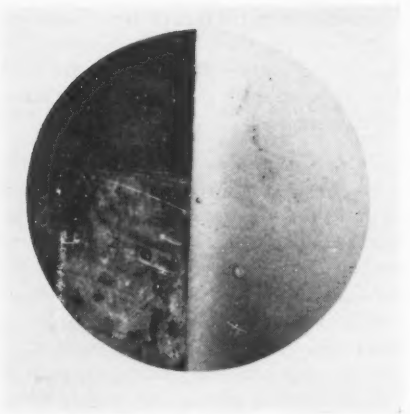

Fig. 4. Left side of silicate disc was treated with stannous fluoride, washed and then placed in sodium sulfide solution for 15 minutes.

of sodium sulfide for 15 minutes. A dark brown deposit formed on the treated portion of the disc (Fig. 4). Likewise, when a silicate disc topically treated with stannous chloride was placed in the sulfur solution, a brown deposit again formed indicating that the stannous ion was the basic cause for the discoloration. Some of the stannous fluoride treated discs were hand brushed 2 times daily, a total of 4 minutes, for a period of 3 weeks. When the specimens were placed in the sulfide solution, they turned dark indicating that the tin on the surface had not been entirely removed and was thus quite tenacious.

In order to determine whether discoloration might occur in solutions containing lower concentrations of sulfur, silicate discs treated with stannous fluoride were stored in synthetic saliva containing 0.00016 per cent sulfur. Within 1 week the characteristic brown stain was evident and the appearance of the discs after 3 weeks' storage can be seen in Figure 5.

Restorations — Thirty-six silicate and resin restorations were placed in extracted teeth. An additional 8 were restored with amalgam. One-half of each restoration was protected by tape before the stannous fluoride was topically applied. After the fluoride treatment, the teeth were brushed in a mechanical brushing machine for periods of 5, 10 and 100 minutes with a popular commercial dentifrice and nylon toothbrush. They were then placed in the 0.5 per cent sulfide solution for 15 minutes. After 5 minutes' brushing, no discoloration of either amalgam or resin restorations was noted except at the marginal areas where a dark stain was evident. Five minutes of mechanical brushing of the silicate restorations failed to remove the precipitate from the surface of the silicate restorations, Figure 6. After prolonged brushing periods of up to 100 minutes, no apparent surface effect was detected, indicating that the deposit had been removed from that area; however, dark marginal stains did appear on exposure to the sulfide solution (Fig. 7).

Ten silicate restorations were treated with stannous chloride and then mechanically brushed for 5 minutes. These were placed in synthetic saliva along with another group which had been treated with a solution of stannous fluoride and brushed for 5 minutes. After 2 weeks in synthetic saliva the appearance of all these restorations was comparable to that found when sulfides of higher concentration were used for shorter periods of time. Also the results

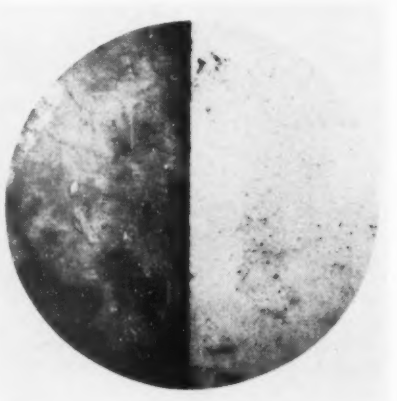

Fig. 5. Left side of silicate disc was treated with stannous fluoride and then placed in synthetic saliva for 3 weeks. Dark stain is evident when compared with right side which was covered.

with stannous fluoride and stannous chloride were similar, indicating the tin ion to be the main causative factor to the staining.

Since no stain had been produced on the resin discs and the only stain noted on the resin restorations was at the margins, it was felt that the effects of stannous fluoride on resin restorations would be primarily related to the marginal adaptation of the restoration. In order to study this variable, 6 resin restorations were prepared using improper manipulative procedures—a pressure technic, finishing the restoration immediately after insertion, etc. Thus poor marginal adaptation could be anticipated.[6] These teeth were then treated with the stannous fluoride solution and mechanically brushed for 15 minutes before being placed in the sodium sulfide solution. Some stain did appear on the surface of the restoration itself, in areas which were porous, but gross darkening was noted at the margins. This would indicate a deposition of relatively larger quantities of the tin at these poorly adapted marginal areas.

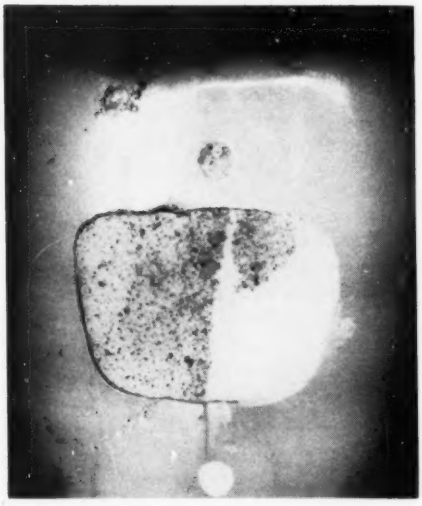

Fig. 6. Left side of silicate treated with stannous fluoride, then mechanically brushed for 5 minutes. Immersion in sodium sulfide still produced stain. (Stain at top on right side of restoration due to leakage and penetration of fluoride solution.)

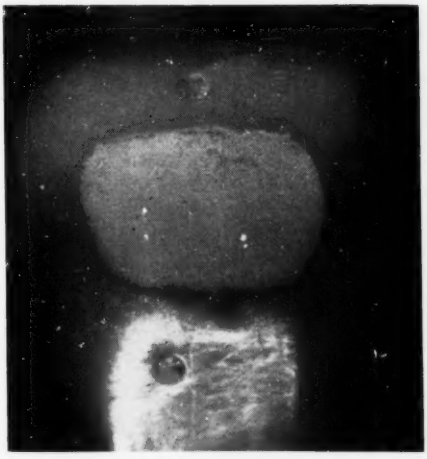

Fig. 7. Entire silicate restoration treated with stannous fluoride, brushed for 100 minutes then placed in sulfide solution. Marginal stain is evident.

These observations had indicated that stain occurs only when the tin ion or tin fluoride accumulated on the surface or at the marginal areas of restorations. It is, therefore, possible that this staining tendency might be reduced or eliminated by the use of some type of protective coating before the application of the fluoride solution. Two materials were tested. The silicate restoration was liberally covered with cocoa butter before treatment, but this material seemed to offer little protection (Fig. 10). Apparently much of the protective coating was displaced or removed when the tooth was swabbed. The second material tested proved somewhat more effective (Fig. 11). It was a cavity varnish† and the amount of stain produced on exposure to sodium sulfide was substantially reduced.

Although no surface discoloration was detected on the amalgam restorations, there was slight staining also at the marginal areas. However, due to the color of the alloy the stain was not as readily evidenced.

†Copalite.

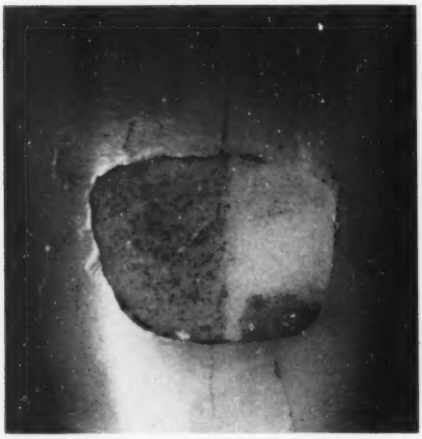

Fig. 8. Left side of silicate treated with stannous fluoride, brushed for 5 minutes and then placed in synthetic saliva for 2 weeks.

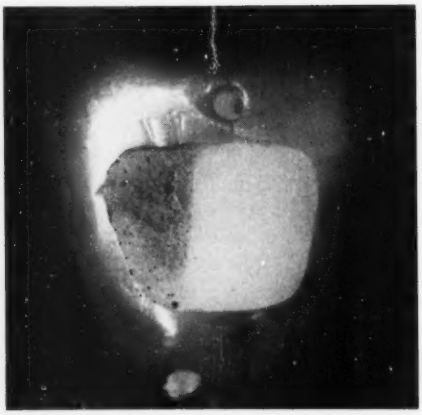

Fig. 9. Silicate treated with stannous chloride solution, brushed for 5 minutes and then placed in synthetic saliva for 2 weeks. Stain is comparable to that found with stannous fluoride. (Fig. 8)

DISCUSSION

These in vitro studies indicate that stannous fluoride, topically applied, might have an effect on the surfaces of silicate restorations. There is a tenacious deposition of some type of tin compound on the surface.

Prolonged mechanical brushing with a dentifrice did remove the deposit from the surface of the silicate restorations; however, when these teeth were placed in a sulfide solution, stain at the margins was still apparent. Stain was also detected at the margins of resin restorations. The degree of marginal stain occurring with the use of stannous fluoride appeared to be dependent on the adaptation of the restorations to the cavity preparation. In those cases where the restorations were willfully placed by a poor technic, the stain was markedly increased. It would thus seem that the precipitate tends to collect or to be trapped in these marginal discrepancies and can be removed only with extreme difficulty. It is evident that the use of a cavity varnish before topical application affords some protection and there are possibly other compounds not tested in this investigation which would be superior. Although the use of such a protective coating might be advantageous in reducing the incidence of marginal stain, it has the disadvantage of preventing the penetration of the stannous fluoride solution into critical areas where protection against recurrent caries is most desirable. This investigation does show, indirectly, that the fluoride solution does penetrate into these vulnerable areas and could thus afford protection against recurrent caries.[5] One would have to weigh carefully the two sides to this problem before recommending the use of a protective coating. It does appear, however, that the coating might have particular merit for the silicate restoration where surface stain is much more pronounced and the incidence of recurrent caries is usually low anyway.[7]

The authors are aware of the fact that the tests employed in this study were of a heroic nature and cannot be readily transposed to the clinical restoration. In the application of stannous fluoride an entire quadrant is usually treated rather than a single tooth; hence, it would be unlikely that one area would be subjected to such a concentration of stannous fluoride. Furthermore, clinical observations[8] in which highly concentrated solutions of stannous fluoride were applied to the teeth of both children and adults and compared to a control group receiving topically applied distilled water

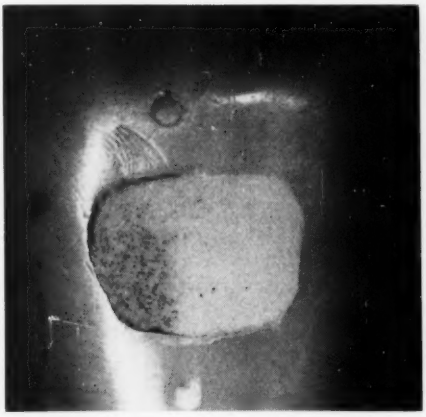

Fig. 10. Restoration covered with cocoa butter offered little protection when swabbed with fluoride solution.

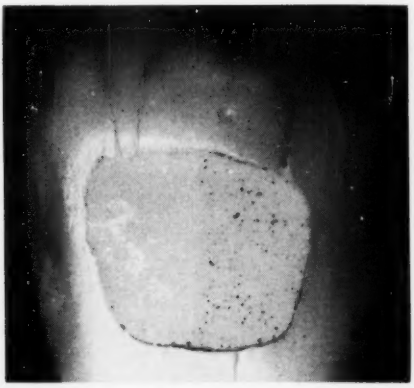

Fig. 11. Varnish on silicate surface reduces staining.

failed to show any cosmetic effect on silicate or resin restorations. In fact these clinical observations seem to indicate that the presence of a stannous fluoride pigmentation on the tooth itself may be associated with caries arrestment.

Of even greater importance is the fact that this stain must be associated with sulfur. In this respect it is comparable to the general problem of corrosion of metallic restorations in the oral cavity.[9] Such discoloration has been attributed to sulfur[10] and the wide variation in the incidence of corrosion has been attributed to factors such as sulfur content in the saliva, mouth hygiene and diet of the individual. Thus it might be expected that these same variables would apply to this problem of staining and the incidence would be of the same magnitude as that of corrosion of metallic restorations—which is quite small.

Therefore, the actual prevalence of stained clinical restorations due to this reaction is unknown. However, these tests do indicate that the possibility may exist, particularly with the silicate restoration. It may be minimized by use of sound operative dentistry in order to assure good marginal adaptation. Likewise the use of a protective coating for anterior restorations before the application of the stannous fluoride solution needs further consideration.

This investigation has not been concerned with any staining effect on tooth structure or the effects of a fluoride containing dentifrice and the results must not be construed as being indicative of what might occur in these cases.

SUMMARY

A white, tenacious deposit collects on the surface of silicate cement discs when treated topically, in vitro, with an 8 per cent stannous fluoride solution. This deposit of a tin compound can react with sulfur containing solutions to form a dark brown precipitate.

The surface of restorative resin materials was not affected by stannous fluoride solutions; however, stains at the margins appeared when these treated restorations were exposed to a solution of sodium sulfide or synthetic saliva. Amalgam and silicate restorations also displayed discoloration at the margins under the same treatment. The degree of staining was related to the adaptation of the filling material.

Such surface or marginal stain can be reduced by coating the restoration with a cavity varnish before the topical application of the fluoride solution.

These observations have been discussed

in respect to their clinical significance.

The authors wish to acknowledge the assistance of Dr. Paul Cleeter who prepared and inserted the various restorations.—*1121 West Michigan Street.*

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Use of Demerol and Scopolomine for Patient Relaxation in Occlusal Equilibration*

by FRANK T. SCOTT, D.D.S., *Jacksonville, Florida*

DEMEROL Hydrochloride possesses analgesic properties midway between morphine and codeine. In doses of 50-100 mg. administered intramuscularly it produces a long lasting analgesia against mild pain, lasting five or six hours.

Demerol also produces a distinct spasmolytic (relaxing) action on smooth muscles of the gut, uterus, bronchi, and the urinary bladder. It also has a tendency to dilate the eye pupil, to diminish the flow of saliva, and has little or no effect on the blood sugar. The blood pressure, cardiac function, and respiration are not appreciably affected by therapeutic doses.

In clinical use demerol hydrochloride produces mild sensory and motor sedation and is suggested as a preoperative sedative. This action is due to a depressive influence on the cerebral cortex.

Demerol hydrochloride is rapidly absorbed being effective in twenty to thirty minutes after injection. It is detoxified by all tissues, but particularly by the liver. The kidneys rapidly excrete the drug and its metabolites.

Demerol by its euphoric action may produce addiction. For this reason it is subject to the National Narcotics Act since July 1944.[1]

Scopolomine Hydrobromide is an odorless, crystalline alkaloid obtained from belladonna. Scopolomine resembles atrophine in its action except that it depresses the cerebral cortex, while atrophine stimulates. The hypnotic action occurs soon after the administration and lasts for several hours. The respiration and circulation are not appreciably affected by therapeutic doses.

Scopolomine and Demerol are synergistic in action, producing in normal doses, a deep narcotic state. This combination is known in *obstetrics* as "twilight sleep." Dosage (1/100 grain) U.S.P.[2]

*Read before the meeting of the Southern Academy of Periodontology, May 29, 1956, Soreno Hotel, St. Petersburg, Florida.

Experience in millions of cases confirms the conclusion of Beck that intramuscular Demerol with Scopolomine offers the best means of securing analgesia and amnesia during labor with least risk to the mother and child.[3]

Toxicity: Side effects following administration are minor in degree and few in number, particularly when considered in relation to the potency of Demerol. Dizziness and mild vertigo are sometimes noted, and for this reason ambulatory patients should always leave the office with an escort and should be cautioned against driving an automobile or undertaking other hazardous activity after receiving the drug.

Infrequently, nausea and vomiting may occur; however, these symptoms usually subside without consequence. Demerol may me combined with barbiturates and local or general anesthetics.

Antidote: Nalorphine hydrochloride has been reported to be a specific antidote against respiratory depression which may result from overdosage or unusual sensitivity to narcotics, including Demerol.[4] This drug should be available for emergency, if needed.

Many of our patients are apprehnesive and should have deep sedation. Many lack the ability to overcome muscle tension and to coordinate jaw movements for proper and adequate occlusal equilibration. There is also the problem of controlling excessive saliva, which is a hindrance in securing clear and accurate markings on the teeth with articulating tape.

When patients seem unusually tense, or the occlusal problem appears difficult, an intramuscular injection (deltoid muscle) of 50 mg. Demerol and 1/100 gr. Scopolomine is given thirty minutes before work is begun. The dosage may be reduced to 25 mg. in small or emaciated individuals. These drugs produce a beautiful state of relaxation. True centric can be more easily identified due to the absence of muscle tension, and the premature points of occlusal contact are more readily found. The mouth secretions literally dry up, and the occlusal equilibration procedures are carried out with very little lost motion.

Experience has shown that Demerol can be given immediately following a light meal, without untoward effects. Appointments for work under the drug should be for at least an hour or longer.

Premedication with Demerol and Scopolomine is especially indicated for highly nervous, tense patients suffering from pain in the temporomandibular joints. These patients are generally very apprehensive and lack good coordination of mandibular movement. In some cases the pain is so severe as to prevent adequate manipulation of the mandible into its true centric position, and proper occlusal equilibration is made more difficult, if not impossible.

There are many patients with all the signs and symptoms of occlusal traumatism in which a proper diagnosis cannot be made without the expenditure of much time and patience in attempts to relax the patient for a study of jaw movements. These are the patients who have little or no muscle coordination and who cannot bite twice in the same place.

There are also many patients who have excessive saliva to a degree as to increase the problems of accurate occlusal grinding.

This excessive flow of saliva can be literally dried up by the intra muscular administration of Demerol and Scopolomine. The effects of dryness in the mouth and throat are noticed almost immediately by the patient. In some cases the mucous tissues become so dry it is necessary to lubricate the lips and mouth with a spray of water to prevent the tissues sticking together. Patients comment frequently while under the effects of the drug about the dryness of the mouth, but express no experience of discomfort from it. The enamel dust created by the grinding stone is withdrawn from the mouth by strong aspiration. Almost without exception the process of locating and correcting the high spots in occlusion can be done with much

less patient objection and interference by having a dry field of operation and a relaxed patient.

Premedication with Demerol and Scopolomine is equally helpful in extensive subgingival curettage and gingivectomy. The pain threshold is elevated sufficiently to reduce the superficial sensitivity of the soft tissues in curettage. There is less pain from needle puncture in administering local anesthesia. Patient reaction to the use of the drug is pleasant and favorable. Some patients experience a mild amnesia as well as analgesia under the drug, and therefore written postoperative instructions should be given following surgery.

CONCLUSIONS

1. There are definite indications for the use of Demerol and Scopolomine in difficult cases for occlusal equilibration.

2. Appointments for work under the drug should be for at least an hour or longer.

3. Patients should always be accompanied by a second person (escort) while under the influence of the drug.

4. Careful examination of the literature emphasizes the safety factor of the drug. Clinical experience in millions of obstetrical cases substantiates this fact.

5. Intramuscular Demerol and Scopolomine is not recommended for use in all cases, but is a very useful means in difficult cases of securing relaxation in restless patients.

6. It not only makes the work easier both for the operator and for the patient, but provides a means of obtaining a more ideal result.

307 Medical Arts Bldg.

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UNIVERSITY OF MINNESOTA SCHOOL OF DENTISTRY

"The University of Minnesota School of Dentistry and the Center for Continuation Study announces its Twelfth Annual Seminar for the Study and Practice of Oral Medicine. Sessions will be held at the Continuation Center in Minneapolis on September 27 and 28, 1957.

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Healthy Periodontium in Chronically Ill Patients

by IRWIN WALTER SCOPP, B.S., D.D.S.,* *New York, N. Y.*

THERE is an abundance of evidence in the literature showing the effects of systemic diseases on the periodontium, but it is rare to see cases of severe chronic systemic disease with a finding of periodontal health. As a matter of fact, the literature shows no cases of periodontal health with chronic systemic disease. Only one case of periodontal health was presented in a 76 year old male without systemic disease.[1]

Yet to emphasize the paucity of specific knowledge of systemic factors in periodontal disease, two cases of severe chronic disease with a healthy periodontium will be presented. Both are hospitalized patients who were examined within the same week during routine dental examination, as part of the hospital schedule. One was hospitalized with active tuberculosis and the other had been admitted for uncontrolled diabetes mellitus, gouty arthritis, and bilateral senile cataract.

Although the effect of systemic diseases on periodontal disease has been exhaustively covered in the literature, its direct effect on periodontal health remains cloudy. At the 1951 Periodontal Workshop held at Ann Arbor, Michigan, the available material was carefully reviewed and maturely evaluated. As a result of this Workshop, an editorial in the J.A.D.A. succinctly stated, "A critical evaluation of the available reports shows that the significance of specific systemic factors as etiological components in the pathogenesis of marginal periodontitis has not been established."[2]

According to Miller, "The problem of an interrelationship between diabetes mellitus and periodontitis merits thorough consideration. Older literature invariably presents the opinion that a patient suffering from diabetes would also suffer from periodontitis, and vice versa. . . . It appears to be proved that there is no close connection between diabetes and periodontal disease. A similar opinion has been expressed by Hirschfeld,[4] namely, that both diseases are 'merely coincidental . . . although . . . some definite periodontal symptoms . . . are . . . intimately associated with diabetes.' "[3]

Burket, in an excellent review of the systemic aspects of periodontal disease, stated, "The exact significance of specific systemic factors as etiologic components in the pathogenesis of periodontal disease cannot be determined. This, however, does not justify a disregard for systemic factors in patients with periodontal disease. Uncontrolled diabetes has an indirect and perhaps a direct relation to periodontal disturbances. Every periodontist should serve as a 'case finder' for this increasingly common disease."[5]

Glickman observed no changes in the gingival tissue or periodontal membrane of experimental animals in alloxan induced diabetes. However, he did show definite evidence of demineralization of the alveolar process.[6]

Again to return to Burket, "Another indirect and perhaps important factor in the development of periodontal disease in the uncontrolled diabetic is the depressed activity of vitamin "C" and the increased requirement of vitamin "B" complex which is associated with the diabetic state. Both conditions may have a detrimental effect on the tooth supporting tissues. The reduced alkaline reserve in the diabetic patient may favor the deposition of calculus with its local irritant effect on the periodontal tissues."[5]

DISCUSSION

Dentists in treating periodontal diseases have referred patients for systemic workup

Chief Dental Service, Veterans Administration Hospital, 408 First Avenue, New York 10, New York.

*Assistant Clinical Professor Periodontia and Oral Medicine, New York University College of Dentistry.

Fig. 1. A 62 year old patient with uncontrolled diabetes, gouty arthritis, and bilateral senile cataract. The gingiva is firm, pink, dense and well keratinized. The architectural form is excellent. The gingiva hugs the teeth tightly with no gingival crevice exceeding 1 mm. The teeth are well worn and closely articulated with the anteriors end to end in centric relation. In various excursions of the mandible, the teeth glide from side to side with the precision and beauty of the gears of an intricate precise mechanism.

to physicians in any of the various medical specialties. Although the value to the patient of these periodic systemic workups is unquestioned, the assistance in the immediate treatment of the periodontal pathosis that these consultations afford to the periodontists is limited. The institution of local therapy to eliminate the etiological factors in periodontal disease and the success with which this can be attained, determines the prognosis in the case.

It is unfortunate that, even after systemic disease is found, medical limitations in therapy preclude its prompt correction. For example, those with duodenal ulcers, metabolic diseases, arthritis, neuropsychiatric ailments, endocrine disturbances or cardiovascular disease are not easily cured. Besides, the direct evidence of cause and effect relationship of these ailments with periodontal disease is not clear at all. The general physical examination is invaluable to the patient but is of limited use to the dentist in clearing up much of the periodontal pathology he encounters in daily practice.

Several theories have been used to explain the mechanism of periodontal pathosis. Selye's General Adaptation Syndrome gives the reaction of the body's regulatory system to combat stress as a possible explanation. Valy Menkin has focused attention on the local inflammatory reaction as caused by an irritant and has given us an insight into the microscopic dynamics of inflammation. Cannon's views using homeostasis and the internal environment or fluid matrix of the organism have been considered. The theories of Selye, Menkin and Cannon are not the specific answers we seek in assisting us with properly weighing the influence and effects on the periodontium of any systemic factors.

In the daily care of patients with periodontal disease, dentists attain success in treatment only in proportion to their ability to eliminate the etiological factors causing the disease. Miller classifies the cause of periodontal disease under the broad terms of dysfunctional, irritational and systemic. The local factors as grouped under dysfunctional and irritational are well known and can easily be identified in

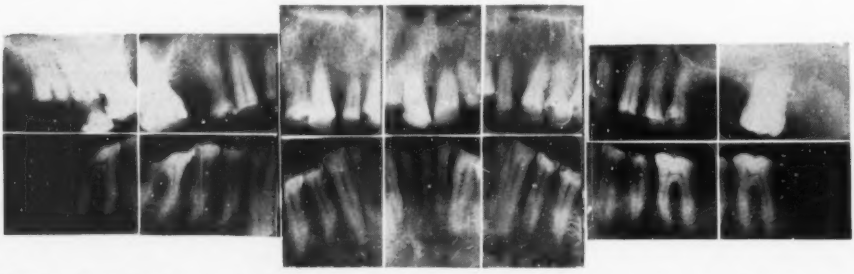

Fig. 2. Roentgenograms of case shown in Figure 1. The alveolar bone is dense, highly calcified and has a uniform distribution of marrow spaces. The lamina dura is well defined, continuous and intact. The clinical crowns are extremely short in relation to the roots, 4/5 of which are imbedded in dense bone.

the individual case. For this reason most often they can be eliminated; but the systemic factors often, if not always, are beyond our skill and knowledge to control or change to our advantage.

All of us have seen in our own practice cases of severe gingival and periodontal pathology in patients with general systemic disease. Yet, with similar frequency we have seen cases of gingival and periodontal pathology in patients who are in apparent good health; that is, the tests we have available today do not show any systemic disease. Although we have a collection of evidence to show systemic effects of generalized chronic disease on the periodontal tissue, this evidence is insufficient to aid us in the routine care of patients' oral health. Although much has been written, too little is known about the systemic effects on periodontal disease to be of real importance in the practical daily management of patients under our care.

Undoubtedly, there is a systemic participation in the etiology of periodontal disease. Otherwise, why would local irritants in one mouth produce a violent reaction, and then in another mouth little or no destruction? But how the systemic factors perform or how they may be affected or altered is not known sufficiently to be valuable in eliminating periodontal pathosis.

The systemic participation in periodontal disease is a determinant of the effectiveness

Fig. 3. Thirty year old colored male with active tuberculosis. The gingival tissues are firm, well stippled, pink and pigmented. There is no evidence of congestion or inflammation in the mouth. The free margin of the gingiva envelops the necks of the teeth in a knife edge collar and terminates at the attachment just beneath the contact point. The gingival architecture approaches the ideal. The gingival crevices do not exceed one mm. A deep overbite is presented in centric occlusion. In protrusive, only the lower central incisors are in contact. The shell crown was placed in the patient's mouth three years ago at his own request to "improve" his appearance. There are no fillings, no caries, no missing teeth, no periodontal disease.

of our treatment plan. Further, periodontal disease itself in turn affects the systemic health. The exact mechanism of both these forces is unknown to us.

It seems that the less that is known of a subject, the more is written about it. The writings on systemic effects on periodontal disease are voluminous.

CASE I

History: This was the first admission to the New York Veterans Administration Hospital of this 62 year old male, white, married, fish peddler. Patient states that he was hospitalized at the Bronx Veterans Administration Hospital approximately 18 years ago because of tender swelling of both knees and pain

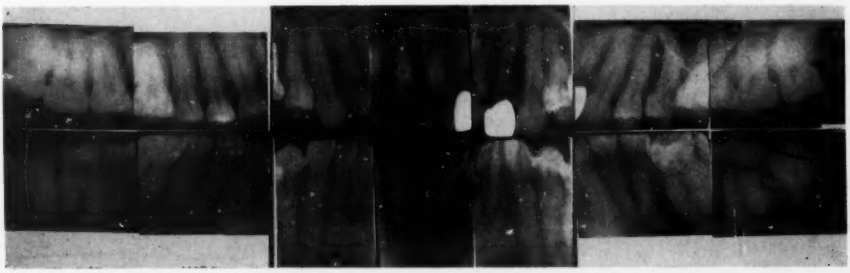

Fig. 4. Roentgenograms of case shown in Figure 3. The cancellous alveolar bone is of even density, highly calcified and has a fairly even distribution of marrow spaces. The lamina dura is continuous, intact and highly calcified, providing protection for the alveolar bone. The long roots are deeply imbedded in alveolar bone. The clinical crowns are short. The level of bone approaches the cemento enamel junction.

in other joints. At that time he was told that he had arthritis. During that admission, diabetes mellitus was noted and the patient placed on a diabetic diet. He was hospitalized later at the Halloran Veterans Administration Hospital with gradual subsidence of symptoms.

The patient was admitted at this time without any evidence of acute disease of the joints. He does state that he has mild weakness of the right lower extremity of several months duration, making it somewhat difficult to walk. The patient realizes that he has had diabetes approximately 18 years. Until this admission, he had never taken insulin and has not adhered to diet with any rigidity. He has noted that his urine has been positive for sugar for the past few months. Appetite has been good. However, the patient states that he has lost approximately 6 lbs. in the past year. There has been nocturia for several years and no significant polydipsia. Patient also stated on admission that he has noted progressive deterioration of his vision during the past 5 to 6 months. The patient has a moderate alcoholic intake of 3 to 4 glasses of beer a day. He does not smoke.

Physical Examination: Patient is a rather frail white male weighing 119 lbs. Patient is cooperative. Examination of the head did not reveal any areas of tenderness or masses. The sclerae and conjunctivae were clear; there were bilateral partial reticular opacities. The oratory canals were clear; the drums were normal. Examination of the nose did not reveal any abnormalities; the tongue was red and smooth and mucous membranes were normal. There was bilateral equal expansion of the chest caves. The lungs were clear to P & A. There were no rales. The heart appeared normal; rate was 84. Relaxation was poor; there were no areas of tenderness; no organs or masses were palpated. A dilated inguinal ring was noted on the left. Genitalia were also those of a normal male. Sphincter tone was normal; no masses or organs were palpated on rectal examination. Examination of the extremities revealed slight swelling of the right ankle and minimal edema of the dorsal of the right foot. There was slight weakness of both legs at the knee and ankle joints. Sensation examination was grossly normal; cranial nerves were intact. Otherwise, physical examination was within normal limits.

Course in Hospital: Following admission, the patient had a persistent glycosuria; and because the patient had a relatively high fasting blood sugar and was underweight, it was not expected that the patient would be controlled by dietary means alone. For this reason, the patient was placed on insulin therapy in addition to his diabetic diet. Diabetic diet consisted of a diet of 1900 calories, 180 grams of carbohydrate, 80 grams of protein, 80 grams of fat. Diet was kept constant throughout his hospitalization. The patient experienced no episodes of either diabetic acidosis or hypoglycemia. 15 units of NPH insulin was found to be the optimal dose of insulin at this time. The patient's urines became progressively free of sugar. Occasionally there was a slight spillage of sugar in the urine. However, it was not necessary to correct this. Blood sugar was noted to be 360 mgs. % on his admission; blood sugar taken approximately two weeks later was reported as 120 mgs. %.

The patient was seen in consultation by the Eye Service. It was recommended that the patient be transferred to the Eye Service for cataract operation. Note was made of the report wherein pleural reaction was noted in the left apex. Additional films should be taken of this area. However, since there is no evidence of any active infection in this area, it is felt that it is not necessary to defer any proposed surgery at this time. Since the patient is well controlled diabetic wise on this date, he is to be transferred to the Eye Service for cataract workup and possible surgery.

Dental History: The patient visited dentists on two occasions. Approximately 20 years ago, two teeth were extracted because of dental decay. When hospitalized 18 years ago, a filling was inserted and two more teeth were extracted because of decay. He brushes his teeth rather haphazardly once a day. There were no complaints of pain, discomfort or bleeding.

Oral Examination: Oral examination reveals a gingiva that is pink, firm, dense well keratinized with excellent architectural form. The gingiva hugs the teeth tightly and no gingival crevice exceeds one mm. The teeth themselves are well worn, short, closely articulated with the opposing jaw. The anteriors touch end to end in centric relation and the various excursions. The teeth are naturally ground into excellent articulation by wear. There are no lateral stresses of any importance.

Roentgenograms reveal dense, highly calcified alveolar bone with an even distribution of marrow spaces. The lamina dura is well delineated, continuous and intact. The clinical crowns are extremely short in relation to the roots. The teeth are well imbedded in dense bone. Despite the fact the patient suffered from uncontrolled diabetes, gouty arthritis, and bilateral senile cataract of the eye, the patient's gingival and periodontal health is excellent.

CASE II

Patient is a 30 year old, colored male born in North Carolina, presently married, and has two children. He was admitted to the hospital for active tuberculosis on June 23, 1955. X-rays at this time showed a chest picture of "Reticulo-nodular infiltrate of both apices." The disease was found on a routine pre-employment chest X-ray for diabetic-food handling position in the hospital. Patient did not appear acutely or chronically ill. There were no subjective symptoms. Physical examination re-

vealed occasional P.T. rales on left posteriorly in the suprascapular area. There was no relevant past history.

The patient was placed on P.A.S. (Para-aminosalicyclic-acid) tablets and rest. During hospitalization, positive sputum was obtained on numerous occasions. There was no fever and no weight loss during his hospitalization. Again on October 19, 1955, chest X-rays and Tomograms showed a pulmonary infiltrate in the left upper lobe, consistent with pulmonary tuberculosis. The photographs and X-rays shown in the illustration were taken October 13, 1955.

The patient's dental history was unique. He visited a dentist only once in his lifetime to have a gold shell crown placed on a healthy upper right lateral incisor to "improve" his appearance. Dental examination revealed a caries free mouth with no fillings and no missing teeth. The gingival contour and architecture are most favorable and conducive to excellent periodontal health. Radiographic examination shows dense bone formation with a prominent lamina dura. The roots are long, well developed and deeply imbedded in densely calcified bone.

The gingival tissues are pink, firm and well stippled. There is no evidence of congestion or inflammation in the mouth. The free margin of the gingiva envelops the necks of the teeth in a collar-like manner and terminates very close to the contact point.

A deep overbite is present in centric occlusion. In protrusive, only the lower incisors are in contact with the upper incisors.

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Case Report . . . .

Allergic Reaction to Periodontal Pack

by IRVING ROMANOW, D.D.S.,* *Boston, Mass.*

A female patient, 36 years of age, presented herself for a periodontal consultation on February 20, 1956. Clinical examination revealed a dark red bluish hue of the gingivae with isolated areas of marginal redness. There was easy bleeding to slight instrumentation as well as a purulent exudate in isolated areas. Probing discovered a moderate to deep pocket formation throughout with eight and nine millimeter pockets, infrabony in type, on the lower first molars and on the mesial of the upper right second molar. There was also bifurcation involvement of all lower molars and trifurcation involvement of the upper second molars. Analysis of the occlusion revealed a Class I occlusion with evidence of premature wear especially involving the right cuspids. There was also some evidence of trauma from occlusion. Active horizontal bone loss could be visualized on the x-ray films as well as isolated areas of vertical bone loss. Approximately one third of the supporting bone had been destroyed.

The systemic history was essentially negative. The paternal grandmother had diabetes. The patient gave a history of low blood pressure. There was no history of hives, hay fever, sneezing spells, rash or any allergy.

*Instructor in Oral Pathology and Periodontology in the School of Dental Medicine, Tufts University.

A seven day food diary demonstrated adequate intake as to texture and content. The patient had an excellent appetite and there was no history of any gastro-intestinal disturbance. The patient appeared healthy and vigorous.

A diagnosis of moderate to severe chronic marginal periodontitis was made. The etiology was considered primarily irritational although dysfunctional factors were thought to play a contributing role.

The proposed treatment plan consisted of deep scaling and curettage procedures to be followed by gingivectomies to eliminate the deeper pockets. Reshaping and equilibration as well as home care procedures were also to be carried out.

The patient responded very well to the subgingival scaling and curettage. A gingivectomy was accomplished about the lower right bicuspids and molars on April 16, 1956. The operated area healed according to expectations and the pack was changed on April 23. No changes in the buccal mucosa were evident at this time. On April 26 the patient telephoned the office with the complaint of swelling of the right cheek and soreness and "itching" sensation of the buccal mucosa. Clinical examination on April 30 revealed a diffuse erythema of the buccal mucosa with many very small vesicles. This affected area was clearly demarcated. It extended from the lower right cuspid to the distal of the lower right second molar and from the occlusal line inferiorly to the buccal fold. The pack was removed and the swelling subsided in two days. On examination May 7, 1956, no evidence of any untoward tissue reaction could be found.

At this time, May 7, 1956, another gingivectomy was done, this time from the upper right cuspid to the upper right second molar. Two days following this operation a similar tissue reaction occurred with much greater severity. There was marked swelling and severe itching and soreness. At this time, however, the tissue involved extended from the buccal line superiorly to the buccal fold. The periodontal pack was removed and all symptoms subsided almost immediately, within six hours. A complete disappearance of all signs and symptoms occurred in three days.

The patient was then advised to have sensitivity tests accomplished for each constituent of the periodontal pack utilized.

The periodontal pack used during this period is popularly known as the Kirkland pack. It consists of zinc oxide, powdered rosin, tannic acid flakes, peanut oil, eugenol and a lump of rosin liquefied in the eugenol.

The patient was patch-tested to each of the ingredients. Forty-eight hours later the tested sites were read with the following results obtained: Eugenol, four plus; Powdered Rosin, two plus; Solid Rosin, one plus. The results of all other test substances were negative. These positive tests suggested an allergic contact type of stomatitis.

Subsequent gingivectomies were accomplished utilizing a pack made up of the following ingredients: Zinc oxide, tannic acid flakes, peanut oil, eucalyptol and paraffin wax. The powder was prepared by mixing four parts of zinc oxide to one part of tannic acid flakes, each part measured by volume. The liquid consisted of one fluid ounce peanut oil, two fluid ounces eucalyptol, to which was added 10 grams of pure white bleached bees wax. It was necessary to warm the liquid in order to melt the paraffin wax before mixing the powder and liquid in the usual fashion.

No untoward tissue reaction was noticed by either the patient or the operator. All subsequent therapy proceeded without complications.

DISCUSSION

Allergy is "a condition of unusual or exaggerated specific susceptibility to a substance which is harmless in similar amounts for the majority of members of the same

species. This term embraces all types of human hypersensitiveness."[1] In a discussion of the terminology employed by writers and investigators of allergy Vaughan and Black describe sensitization as the rendering of an organism specifically reactive to a substance so that exposure to this sensitizing substance is followed by a reaction different from that occurring in the normal organism or animal. This reaction is described as being quite different from the physiologic effect of the sensitizing substance. It is said to be brought about by extremely small amounts and not dependent in any way upon any toxic action.[2] Contact allergy usually involves a person who is not primarily sensitized but who, after a period of contact, becomes sensitive to the allergen. The reaction is localized to the area of contact and characteristic. The patch-test is considered of diagnostic value in such cases. Fortunately the patient referred to above had a reaction of rather short duration. Highly reactive persons have been known to produce a reaction that may persist for several weeks.[3] Although the above mentioned test demonstrated a reaction in forty-eight hours, observation of the patch-tested area should continue up to a week or longer. Delayed reactions of this type occasionally do occur.[4,5]

The pharmacological action of a drug should not be confused with an allergic response. The major difference being that the symptoms of an allergic reaction do not develop on the first exposure but an incubation period is required. Some other differences are: an allergic reaction may be produced by an amount of the drug much less than necessary to produce a pharmacological action; the allergic symptoms are not related to the pharmacological action; a very small percentage of the population will show evidence of an allergic reaction while the pharmacological action should be approximately the same throughout the population.[6]

It is interesting to note that the sensitivity may be due to the entire molecule of the chemical substance or may be more specifically related to only a certain chemical grouping. Sulzberger (1940), is quoted by Vaughan and Black as having satisfactorily summarized the criteria for eruptions due to drug allergy. Some of these are: Very minute amounts of a drug which has been well tolerated for weeks, months or years may suddenly produce severe eruptions. Once an eruption has occurred it may recur upon subsequent minute exposures to the offending or a related drug. As a rule the cutaneous response is entirely different from that produced by the pharmacologic or toxic action of the drug. The amount required to elicit eruption may be much smaller than that required to produced pharmacologic or toxic effects. The role of cumulative effect can be ruled out. Eruptions can recur upon reexposure to small amounts and even years after the last exposure.[7]

The above mentioned case can therefore be classified as a contact type of drug allergy.

Treatment consists of the cessation of use of the offending substance. Relief of acute symptoms may be effected by use of the anti-histaminic drugs.

100 Boylston Street

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IN PERIODONTIA, IN EXTREMIS*

A small tale of dental woe that does entail a story of our gums that go before the scourge of Perio!

Perio, oh Perio!
The teeth are good,
but the gums must go,
The Doctor says, and he should know,
That's why I sing of Perio!

And so each Friday filled with dread,
I force myself with measured tread,
Toward a fated rendezvous,
And hope I'm left with means to chew!

Dr. Ray, with urbane air,
And Mother Perio are there;
Student Maxwell, too, I see
Awaits my presence, filled with glee!

They quickly strap me in the chair,
Insert the needle here and there . . .
When they feel I'm ready, then,
The steady slice of knives begin!

As I feel my life's blood issue,
They cut the epithelial tissue
And talk of gingivectomy
And also osteoectomy,
And though this may be mere semantic
The whole thing drives me nearly frantic!

Yes, as I sit there frantic,
The talk is quite pedantic,
As the learned Doctor operates on me.
They feel that this condition
Might stem from poor nutrition,
Though other factors, true, are there to see;
And in etiology
There's thought perhaps psychology
May paint the picture just as vividly!

But no matter what the reason
That caused my gums to go,
I'll not forgot the season
I lost to Perio!

*Written by a patient of the University of California and forwarded to the editor by Dr. Harold Ray.

Announcements . . . .

CHANGES IN THE COMMITTEES FOR THE AMERICAN ACADEMY OF PERIODONTOLOGY FOR 1957

Secretary Clarke Chamberlain has announced that changes have been made in several of the committees of the American Academy of Periodontology for this year. The original list was published in the January issue of the JOURNAL OF PERIODONTOLOGY, pages 71, 72 and 73.

Dr. Samuel Parks is to be co-chairman with Dr. Edward B. Spalding of the History Committee and Dr. James Aiguier has been added. Drs. Carlos Schott, Arthur H. Merritt, John O. McCall and Edgar D. Coolidge are not to serve on this committee.

The Public and Professional Relations Committee is composed of Dr. S. Levy, chairman, and Drs. R. G. Kesel, A. Cohen, F. Fabrizio and G. P. Ivancie.

Dr. Murray Cox is to be co-chairman with Dr. Justin Towner on the Round Table Luncheon Committee.

Dr. Harvey Janke replaces Dr. W. F. Andes in the Publicity Committee and Dr. R. L. Reeves is to serve as co-chairman with Dr. M. J. Calbeck on the Clinic Committee.

Dr. R. Chace replaces Dr. M. Sugarman as chairman of the Credentials Committee.

BAYLOR UNIVERSITY COLLEGE OF DENTISTRY

The division of graduate studies, Baylor University College of Dentistry, Dallas, Texas, announces the following graduate courses of study in Periodontology, beginning September, 1957:

1. A nine month course of graduate study in Periodontology, leading to the degree of Bachelor of Science in Dentistry. This course consists approximately half of advanced study in basic science and half of clinical study.

2. A twenty month course (two regular school terms and one summer session) of graduate study in Periodontology leading to the degree of Master of Science in Dentistry. This consists essentially of the B.S.D. course above, followed by a summer term of clinical experience and then a second full nine month term of advanced study in theory and clinical practice of Periodontology. A thesis is required.

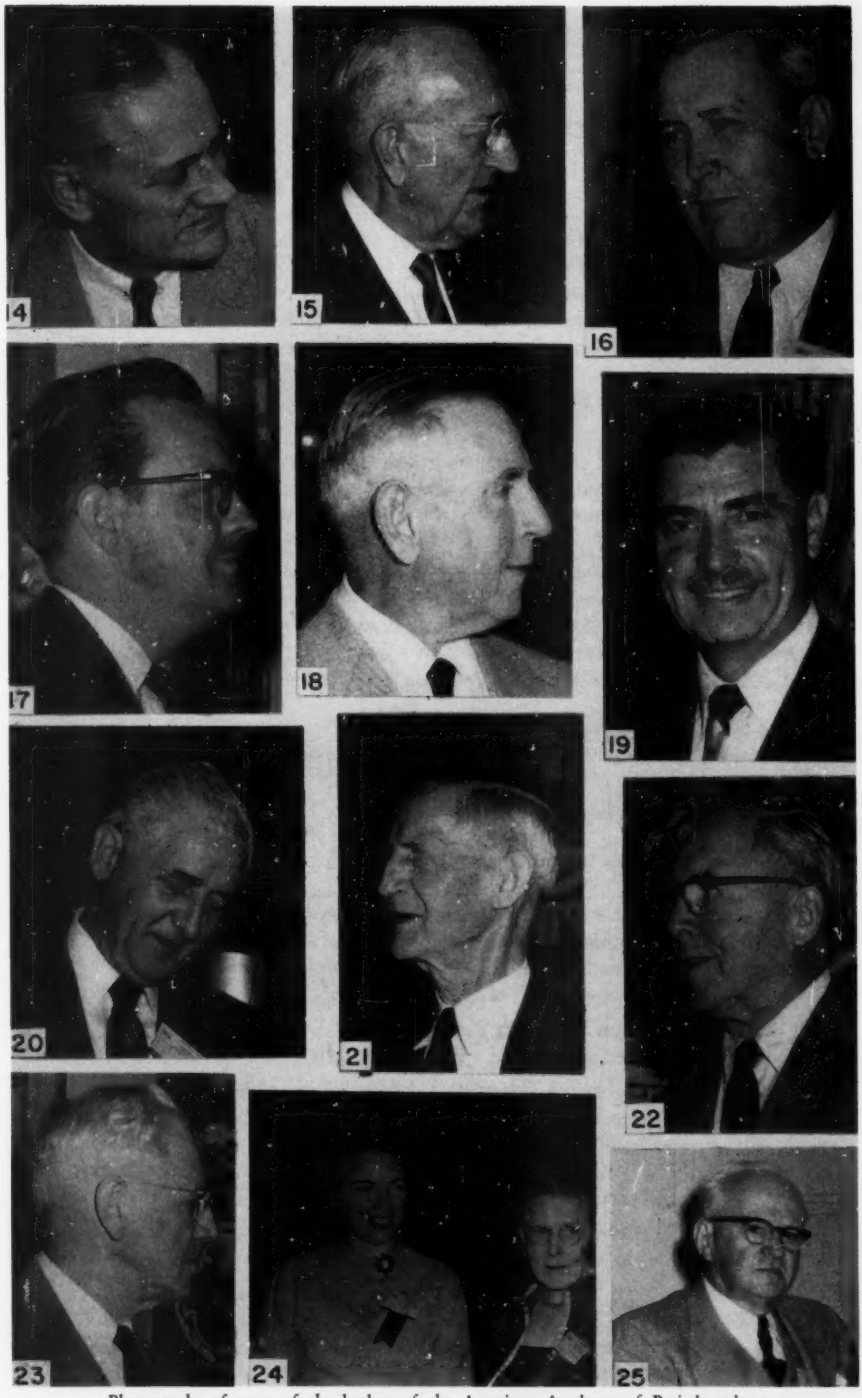
Baylor has a modern school plant fully equipped for undergraduate and graduate study and completely air-conditioned. Every opportunity is offered the graduate student to prepare himself for the practice of Periodontology. For further information, write to the Registrar, Baylor University College of Dentistry, 800 Hall Street, Dallas 10, Texas.

AUTHORS TO BE ASKED TO PAY FOR EXCESSIVE NUMBER OF CUTS

The editor regretfully announces that authors requesting publication of an excessive number of cuts in the future will be requested to pay at least part of the cost of preparation of the engravings. The actual number of cuts permissible will depend upon the text material but in most cases should not exceed twelve.

Photographs of some of the leaders of the American Academy of Periodontology

1. Past President Harold Ray, San Francisco; 2. Retiring President R. G. Kesel, Chicago; 3. President Stanley Baker, Greenwood, South Carolina; 4. Dr. I. Glickman, Boston; 5. Dr. Harold Leonard, New York; 6. Dr. I. Hirschfeld, New York; 7. Dr. Edgar Coolidge, Evanston, Illinois; 8. Dr. James Aguier, Philadelphia; 9. Dr. D. Nachazel, Milwaukee, Wis.; 10. Dr. Clarke Chamberlain, Secretary, Peoria, Illinois; 11. Dr. Hunter Allen, Birmingham, Alabama; 12. Dr. Roger Turner, Miami; 13. Dr. J. McKenzie, Miami.



Photographs of some of the leaders of the American Academy of Periodontology

14. Dr. Ray Johnson, St. Paul, Minnesota; **15.** Dr. Justin Towner, Memphis; **16.** Dr. J. Hollers, San Antonio; **17.** Dr. B. O. A. Thomas, Palo Alto, California; **18.** Dr. Walter Leabo, Shreveport, Louisiana; **19.** Dr. F. Beube, New York; **20.** Dr. Joseph Bernier, Washington, D. C.; **21.** Dr. Ed. Spalding, Birmingham, Michigan; **22.** Dr. Eddie Ball, Cincinnati, Ohio; **23.** Dr. Robert L. Dement, Atlanta, Georgia; **24.** Dr. Elizabeth Downie, Detroit, Michigan, and Dr. Mildred Dickerson, Washington, D. C.; **25.** Dr. Carlos Schott, Cincinnati, Ohio.

(Photographs taken at Atlantic City meeting (1956) by Dr. Howard Hartman of Cleveland, who so far has refused to send the editor his picture.)

REPORT OF THE AD HOC COMMITTEE TO THE EXECUTIVE COUNCIL OF THE AMERICAN ACADEMY OF PERIODONTOLOGY

PREAMBLE: On September 3, 1954, the Secretary of the Academy announced the appointment of an Ad Hoc Committee charged with the responsibility of reviewing the over-all objectives and present functioning of the Academy with special reference to its selection of members, programming and relationship to other specialties of dentistry. The members of this committee were announced as follows: Dickson Bell, James Aguier, Raymond Johnson, Hunter Allen and Joseph L. Bernier.

On February 5, 1955, this committee presented its first report to the Executive Council. This report was largely designed to delineate the special areas and problems to which the committee should direct its attention. It served as a mechanism for establishing an agenda which the committee could pursue in its deliberations. Five specific matters were considered germane to the committee's responsibilities and are herewith again listed as a matter of record:

A. Should specific recommendations be made regarding the Academy's scientific program with the view of stimulating present and future members and if so what should these proposals be?

B. Should a requirement be established for the maintenance of active membership and if so, what should it be?

C. In view of the modern trend toward specialization, should the Academy consider additional educational activities to further interest in the knowledge and practice of periodontia? For example, special post-graduate courses.

D. What efforts, if any, should the Academy make to assist in the improvement of the undergraduate teaching of periodontia?

E. Is there merit in attempting to develop a closer liaison with other special groups in view of the parallel extension of periodontia through many other specialties?

It will be noted that in all of the expressions listed there is a constant undertone bearing on membership in the Academy—specifically with regard to the duties and attitude of the member to the organization and the responsibilities of the Academy to its membership.

Your Ad Hoc Committee has pursued these items on an individual basis and as a result of the composite viewpoint, in addition, wishes to comment in the special area of membership as referred to above. To this end, Item B of the Agenda will be considered last.

It is important to note that the data to be presented are based on the written expressions of the committee members to the Chairman. The digest of these remarks was accomplished by the Chairman who assumes full responsibility for any deviations from the philosophies of the committee members which may have occurred in this procedure.

A—Should specific recommendations be made regarding the Academy's scientific program with the view of stimulating present and future members and if so what should these proposals be?

On this point your Ad Hoc Committee feels that certain improvements can and should be made in the scientific program of the Academy. The committee feels that they have a most important bearing on the member's reaction to the Academy which is manifest in his desire to become active in its affairs. The analyses of attendance at the Annual Session, to be discussed later in this report, indicates the need for recognizing that efforts in this direction are most important.

The following recommendations are considered worthy of consideration in future scientific programming:

1. That the preparation and design of the scientific programs be undertaken by individuals with knowledge and experience in teaching and instructional programming and that those accorded this responsibility be carefully selected well in advance of their year of performance. The mechanism for their functioning within the administrative framework of the Academy seems adequate under the present system.

The committee feels that there may be some merit in having all scientific programs submitted to the Council for review one year in advance of presentation. On this point, however, it makes no specific recommendation.

2. The committee feels that while the scientific level of the Academy's programs should be in general above that presented by the American Dental Association, that it is most important to consider the interests of those who are "general dentists" and therefore seek the advice of those with greater experience in periodontia. Further, that the Academy adopt the philosophy that its Annual Session and Spring Conference are, in essence, post-graduate courses in the eyes of many who find it impossible to attend more formal courses.

3. It would appear that the Annual Session should be designed to include well documented case reports, presentation of research findings and discussions on therapeutic procedures. The committee is firm in its belief that the management of periodontal patients must ever be the underlying theme of the Academy scientific programs. Relegation of speculative resarch to a lesser position in future programs would be highly undesirable yet every attempt should be made to establish the importance of such presentations to the patients' care.

4. Greater emphasis should be placed on discussion of all presentations. The committee feels that much value accrues from deliberations in the manner of the open forum. These can serve to develop a mental climate conducive to the better understanding of the practice of periodontia.

5. Finally, your committee feels that both the Annual Session and the Spring Conference should be concerned as the hub of dental practice and that greater emphasis should be placed on the unquestioned relationship of periodontal health and disease to the practice of dentistry.

C—In view of the modern trend toward specialization, should the Academy consider additional educational activities to further interest in the knowledge and practice of periodontia? For example, special post-graduate courses.

On this point your committee feels that the Academy should not extend its educational activities beyond the Annual Session and Spring Conference but should concentrate on further refinements of its present activities. We recommend, however, that every effort be made to encourage dental schools, and in isolated areas, dental societies, to present instructional programs in periodontia and to this end be prepared to suggest individuals who might serve as speakers.

D—What efforts, if any, should the Academy make to assist in the improvement of the undergraduate teaching of periodontia?

1. The Committee is of the opinion that there is need for improving the undergraduate teaching of periodontia. It feels that the variability of such programs in dental schools, with regard to content and emphasis is a matter of concern. It should be pointed out, however, that this is not a plea for "standardization" of programs since such an objective might be considered to imply a curtailment of intellectual freedom.

2. We feel that the nidus of teacher and research workers represented in the Academy membership affords an excellent opportunity for study of this problem. Organization of this group into a working unit through committee activity, would pose no great administrative problem. Your committee feels that this could well be the subject of a spring seminar when the problem could be thoroughly discussed, objectives defined and operational committees formed. Representatives of the American Association of Dental

Schools and the Council on Dental Association should be present for their deliberations.

E—Is there merit in attempting to develop closer liaison with other special groups in view of the parallel extension of periodontia through many other specialties?

Your committee feels that this is a most important matter and that it should be considered in much detail. In the preparation of this report this was not possible. We, therefore, feel that consideration of this item and the mechanisms by which it might be accomplished should be discussed further by this committee. This item will, therefore, remain on the agenda for study and report at a later date.

B—Should a requirement be established for the maintenance of active membership and if so, what should it be?

This Ad Hoc Committee is cognizant of the present discussions underway regarding the mechanisms for selection of associate members and their elevation to active membership. Our report on the item "B" above does not bear directly on this point but may provide certain data useful in such discussions.

In approaching the matter of the desirability of establishing a requirement for sustaining either associate or active membership this committee felt that there was a need for factual data on attendance at the Annual Session since this is the principal measurement of the interest of members in the Academy's activities and that such data would probably form the basis for any requirement to be recommended.

Through the good offices of the secretary, a complete attendance record of all members for the years 1952-53-54 was made available. The following remarks are analyses of these figures:

A total of 484 names appeared on this roster as follows:

Active members	241	(incl. 13 "new active")
Assoc. members	196	
Academy members	8	
Non-Res. members	12	
Retired members	4	
Honorary members	3	
Resigned	9	
Deceased	9	
Dropped	1	
Past Service	1	

Although those in the last four categories would not be reflected in the attendance figures, nevertheless the list was assessed on the basis of the total number of names submitted (484).

Of the total 484 listed, 196 have not attended a meeting in the past 3 years—this is 40.5 per cent attendance or 59.5 per cent non-attendance.

One hundred and thirteen of the 484 listed attended one meeting during the past three years for a percentage of 23.3 attendance or 76.7 per cent non-attendance.

Eighty-four of the 484 attended two meetings during this three year period for a percentage of 17.3 attendance or 82.7 per cent non-attendance.

Ninety-one of the 484 attended the three meetings for 18.8 per cent attendance and 81.2 per cent non-attendance.

Active Membership—

Of the 241 active members listed in the group of 484 names—

85 or 35.1 per cent have not attended any of the 3 meetings
48 or 19.9 per cent have attended one meeting
39 or 16.2 per cent have attended two meetings
61 or 25.3 per cent have attended three meetings

Associate Membership—

Of the 196 Associate members listed in the group of 484 names—

75 or 38.2 per cent have not attended any of these meetings
53 or 27.0 per cent have attended one meeting
44 or 22.4 per cent have attended two meetings
24 or 12.2 per cent have attended three meetings

Your committee has made but a single general observation on these data at this time and that is to the effect that there is an obvious need for discussing what can be done to stimulate attendance at meetings.

September 26, 1956

PREAMBLE: On February 5, 1955 at Chicago, the Ad Hoc Committee to the Executive Council of the American Academy of Periodontology reported to the Executive Council its proposed agenda. Briefly stated this was to deal with a review of the Academy's purpose and function to consider certain problems concerning the selection of members and to assess the impact of specialization upon its future activities.

On October 12, 1955, in San Francisco, the Ad Hoc Committee reported on the five items comprising the agenda. Your attention is invited to these reports for detailed data, copies of which are attached.

Your Ad Hoc Committee wishes to comment further on certain items on its agenda which it feels have not been acted upon in relation to previous suggestions. Further, it wishes to express an opinion on the matter of the formation of regional sections, this proposal of past president, Harold Ray, having been referred to this body for its recommendations.

This report then, will begin with Item A of the agenda as recorded previously.

A. Should specific recommendations be made regarding the Academy's scientific program with the view of stimulating present and future members and if so, what should these proposals be?

In our report of October 12, 1955, the committee made five specific recommendations in reply to this question. Summarized, we suggested (a) that more thought be given to the preparation of the program; (b) that there was merit in submitting the program to the Executive Council one year in advance; (c) that in determining the scientific level of the program, appropriate committees take into consideration the "general dentist"; (d) that document case reports be included in the program of the annual session, and (e) that more time be allowed for the discussion of all presentations.

We wish to again emphasize these recommendations, particularly the need for preparation of the program one year in advance and for more discussion time by the audience.

With regard to the former, we can anticipate certain minor difficulties; however, they are by no means unsurmountable. Publication of the program in the journal one year in advance of its presentation would seem to be most desirable.

The committee particularly wishes to stress its feeling that more time for discussion of presentations is needed, and that more attention be paid to promptness throughout.

While we have suggested that the "general dentist" should be considered in selecting the subject matter of the program, the committee is of the opinion that the current program for Atlantic City may lean too far in the direction of the "practical side."

Finally, we are concerned over the poor attendance at the Spring Seminar. We feel that serious thought should be given to holding this session in other areas of the country from time to time and to the advisability of having a special program commitee select subject matter to be reviewed by the Executive Council one year in advance, as in the case of the annual session.

With respect to Item B we feel that excellent progress has been made regarding the establishment of criteria for the maintenance of active and associate membership. This item will, therefore, be removed from the agenda. We wish, however, to strongly urge the adoption of the Section "D" of the report of the Special Committee on Membership Problems, recommending that "attendance at one annual session in a five year period be established as a requisite for the maintenance of active and associate membership."

Item C of the agenda posed the following question:

"In view of the modern trend toward specialization, should the Academy consider additional educational activities to further interest in the knowledge of periodontia. For example, special post-graduate courses."

Your committee feels that its previous recommendations on this item remain germane. We wish to call attention to the references made to the programs of the annual session and the spring conference contained in Item A of this report. This matter will, therefore, be removed from the agenda of the committee.

The next item, Item D, reads as follows:

"What efforts, if any, should the Academy make to assist in the improvement of the undergraduate teaching of periodontia?"

Our recommendations on this item, in the report of October 12, 1956, were presented in two parts. We feel that to these, little can be added. It seems wise to stress again the feeling of the committee to the effect that no program should be underaken by the Academy which could be interpreted as "dictation" to the dental schools in the design of their curricula. The committee feels, nevertheless, that each member of the Academy should assume as a personal responsibility, the role of a "supporter of appropriate teaching of periodontology in dental schools." No doubt a great deal can be accomplished with this approach. We further feel that there is merit in a suggestion that the Academy design a template of what it considers a typical and adequate department of periodontia, this to include (a) status of the department in the schools' organizational plan; (b) its personnel; (c) curriculum of such department in terms of hours and subject matter, and (d) other pertinent data. This information would be available upon request and would not represent a requirement being imposed by the Academy upon dental schools.

The final item is labeled E and reads as follows:

"Is there merit in attempting to develop closer liaison with other special groups in

view of the parallel extension of periodontia through many other specialties?"

On this point your committee is unequivocally unanimous in the affirmative. To implement this, however, is difficult and complex. One can readily see the need for discretion in any program which presupposes a re-orientation of the thinking of other special groups. We would, therefore, like to devote further time to this matter and to report at a future date. Our deliberations have already focused upon many difficulties about which we shall speak later.

Special Item: At the Mid-year meeting of the Executive Council of the Academy, the proposal of Doctor Harold G. Ray for the establishment of regional sections within the academy was referred to this committee for study and recommendations. We wish to present our views on this matter as a part of this report.

Each of the committee members has given serious thought to the problem and it is the consensus of this body that while some advantages might accrue from such a reorganization, the disadvantages would outweigh them.

The points in favor of the proposal are thoroughly outlined in the discussion prepared by Doctor Ray. These need not be repeated here. We shall point out those things which we feel outweigh these advantages.

(1) Our committee feels that the Academy membership is too small and too peculiarly dispersed to provide adequate representation in some geographic sections.

(2) There is reason to believe that the number of applicants for membership would increase markedly if individual sections were authorized to act upon nominees from their region. Even if this mechanism were retained with a central body, it is likely that such an increase would occur. Accepting, as we do now, 40 to 50 members per year, and losing 15 to 20 each year through deaths, resignations, etc. seems to insure an adequate and healthy growth.

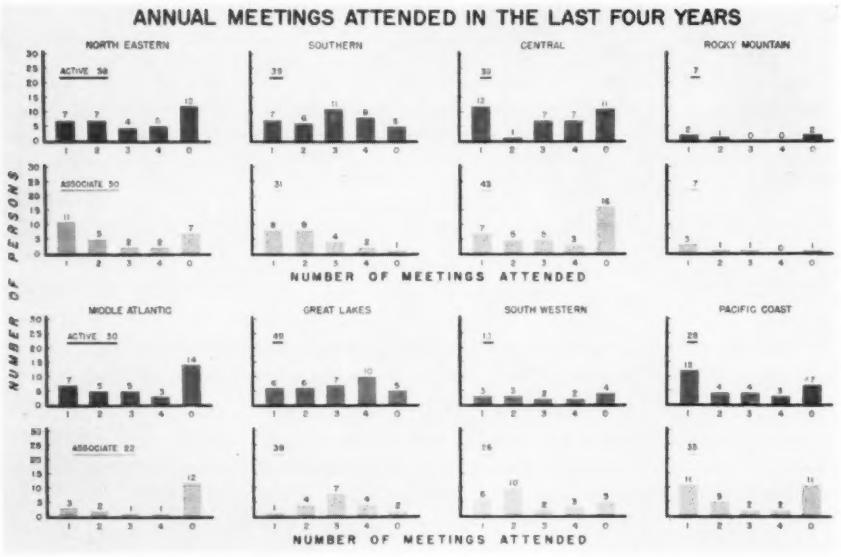
(3) The committee feels that under the present method of operation, ample opportunities exist for developing leadership within the organization if these opportunities are sought for by those wishing to promote the welfare of the Academy.

(4) On the matter of regional study clubs, we feel that such activities can be undertaken at the present time by those having such interests, indeed it would seem that under the present method of operating, club members could devote their full time to scientific matters without any burden of administration and without interference from the parent organization.

(5) It would seem inevitable that the regional sections would require financial support from their membership which, when added to the present Academy dues would reflect an appreciable increase to academy members. This we feel would not be desirable.

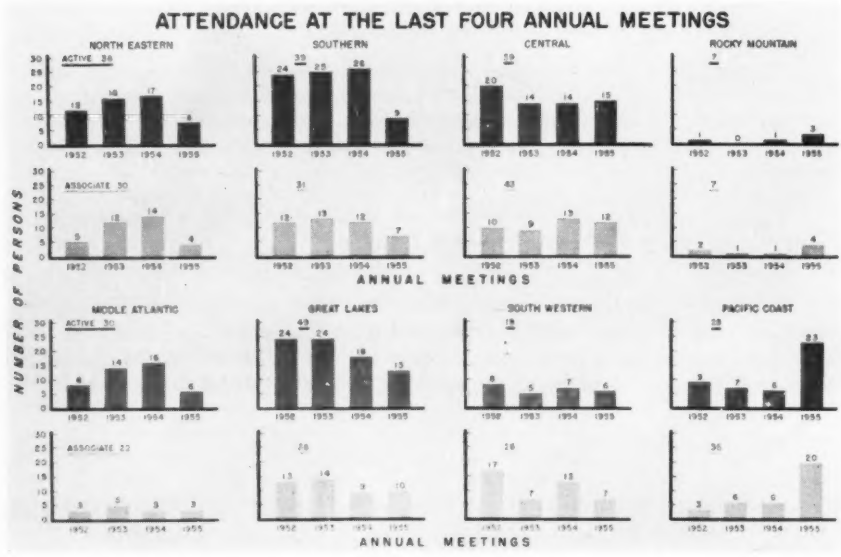
(6) With respect to the matter of enhancing academy membership and promoting better integration of the membership, it is our considered judgment that these objectives can be better accomplished by constantly reviewing the annual session and the spring seminar to insure their adequacy in and applicability to the current problems in periodontia.

While other points could be mentioned, we feel that these are sufficient to support our contention. It is, therefore, recommended that the proposal of Doctor Harold G. Ray, for the establishment of regional sections, be tabled for possible reconsideration at a later date.



As an appendix to this report, our committee wishes to present certain information compiled relative to attendance at previous annual meetings. These data take into consideration attendance of those within certain geographic areas in relation to the location of the annual session. Active and associate members are listed separately for comparison.

In the interests of simplicity, the regional areas suggested by Doctor Harold Ray were used as points of reference. Thus, some measure of information was obtained which might be projected into the regional section plan. Because of the complexity of the



statistical data it has been placed on charts. Copies of the charts are appended to this report for your detailed reference.

As mentioned before, this report, as well as those submitted previously, was compiled from the narrative expressions of the committee members. The chairman has attempted to digest and coordinate these remarks and assumes full responsibility for any misinterpretations or omissions which may have occurred in so doing.

Dickson Bell, D.D.S.
James E. Aiguier, D.D.S.
Raymond E. Johnson, D.D.S.
Hunter S. Allen, D.D.S.
Joseph L. Bernier, D.D.S.,
Chairman, Ad Hoc Committee

THE WILLIAM J. GIES FOUNDATION

For the Advancement of Dentistry, Inc.

1956 ANNUAL REPORT OF THE PRESIDENT

This year records the passing of dentistry's greatest benefactor, William J. Gies. He died on May 20, at his home in Lancaster, Pennsylvania, of a cerebral hemorrhage. Dentistry suffers the irreparable loss of one who spent the greater part of his unusually active life advancing dentistry through research, education, journalism and kindred fields. He earnestly believed in the importance of dentistry in relation to the public health and moreover, he had the ability to inspire others with his beliefs. William J. Gies was a wonderful teacher, a great inspiration and an irreplaceable friend.

In the loss of this practical idealist the officers, directors and members of the Foundation became rededicated to the advancement of all those facets of dental progress to which William J. Gies wholeheartedly and unselfishly devoted so many years.

The Foundation is gratified that Mrs. William J. Gies has accepted membership in the Foundation to fill the vacancy created by Dr. Gies' passing.

On a number of occasions during the past few years Dr. Arthur H. Merritt expressed the desire to be relieved of the many responsibilities of the presidency, but he was prevailed upon to postpone his decision. However, at the October 25 meeting of the Board he tendered his resignation, which was accepted with deep regret. The many expressions for the continued need of his wise counsel and guidance persuaded him to accept the office of Honorary President. Dr. Merritt has also agreed to continue serving the Founda tion as a director and member.

Dr. Bissell B. Palmer was elected President, Dr. S. Ellsworth Davenport, Jr., was elected as Vice President, and Dr. Alfred L. Kohn was elected to the office of Secretary-Treasurer.

The financial condition of the Foundation has improved during the past year, having received an anonymous contribution through Dr. Gies of $9,067.50, a contribution of $250 from Dr. Arthur H. Merritt, and an unrestricted gift of $500 from the Henry Spenadel Fund. Also, $2,757 was received as a result of a fund-raising effort. The latter was very gratifying because of the 2458 dentists solicited almost 300 responded, and

their contributions came from 35 states in the United States and Europe—evidence of the great esteem in which Dr. Gies was held.

An Auxiliary Board came into being during the past year, composed of the following members: Drs. John Asch, Henry Chase, Gerard L. Courtade,* Charles Hattauer, E. Byron Master and John P. Traugott. This board will devote itself to the future of the Foundation by participating with the Board of Directors in the activities of the Foundation. The officers and directors take satisfaction from the fact that the Auxiliary Board has given constructive attention to the several tasks and responsibilities given it. In particular, they have organized two new committees, the Editorial Award Committee and the Advisory Committee on Grants.

During the year the Foundation made a grant of $200 to the Journal of Periodontology and a grant not to exceed $300 to the Annals of Dentistry. A number of other applications were received during the year but their purposes did not meet the basic requirement of serving broadly to advance dentistry. In this connection it seems desirable to more definitely describe the type of grants which come within the policy of the Foundation. Basically, projects that advance dentistry in the broadest sense come within the program of the Foundation. It is recognized that there are many other laudable undertakings in dentistry which deserve financial support. However, the Board of Directors believes that it will best serve the purposes for which the Foundation was conceived, and which is a part of its title, if it limits its grants as described. For instance, projects that will tend to improve the journalism of the profession, advance the potentialities of dental research or dental education in its broader aspects, would have the effect of advancing dentistry. On the other hand, a grant to provide a mobile dental unit for a community, or to provide an individual's tuition for an undergraduate or postgraduate dental course of study, while laudable in purpose, would seem more suitably to be the function of the larger or more general purpose foundations.

Since the incorporation of the Foundation we have received more than $22,000 in contributions from anonymous friends of Dr. Gies. These gifts were presented to the Foundation through Dr. Gies and it would seem conservative to assume that with his passing there will be a discontinuance of these donations. Such a prospect naturally causes a reappraisal of the rate of growth of the Foundation's funds in the immediate future. However, the Foundation will continue to seek funds from the members of the dental profession who, admiring Dr. Gies and being grateful for his many benefactions, will wish to contribute to the advancement of dentistry through the agency founded to honor him. In addition, it is contemplated to make other approaches to augment the capital funds of the Foundation.

One of Dr. Gies' last wishes expressed to the Foundation was that it make itself and its program known to the profession generally, that it become an active, constructive organization, and that it devote itself intensively to the advancement of dentistry. Dr. Gies explained that it was for these purposes that certain of the anonymous gifts to the Foundation were made, and in one of his last letters he expressed real gratification that the Foundation had secured the part-time services of Lillian O'Gorman to be the administrative assistant to the executive officer of the Foundation. Mrs. O'Gorman's background and interest in the purposes of the Foundation make her a valuable asset to the organization.

In closing your president wishes to pay tribute to the great leadership of Arthur H.

*Dr. Courtade found it necessary to resign on January 23, 1957. Dr. George C. Paffenbarger was elected to fill this vacancy.

Merritt in initiating the foundation and in guiding it through the first several years of its existence. It was at his call in 1936, and in his office, that the first meeting was held of the committee that inaugurated the project leading to the setting up of the Foundation. His idealism will be a constant inspiration to those of us who have been entrusted with the continuance of the program.

Bissell B. Palmer, President

Letters to the Editor . . . .

To the Editor:

I feel impelled to offer a few comments on the paper "A Measure of Tissue Response to Frequency of Toothbrushing" by Dr. W. R. Stanmeyer. This paper appears in the January 1957 issue of The Journal of Periodontology.

The point on which I am commenting is an old problem in semantics which has been the subject of extended discussion over a period of many years. I regret that the problem persists.

Dr. Stanmeyer's paper reports a study on the effects of toothbrushing. This is stated in the title of his paper. However, the first two words in the first sentence of his paper are "gingival massage." He then proceeds to discuss gingival massage at great length. The seventh paragraph of his paper reads as follows:

"This paper is concerned with a study of the correlation of the oral soft tissue health with the frequency of *toothbrushing* in an attempt to further contribute to the scientific knowledge that the health of the gingivae is increased by *massage* and that there is an optimal frequency of stimulation through toothbrushing to maintain this healthy state." (Italics mine.)

I deem it important to remind the author that toothbrushing, in addition to exerting a massaging influence, is primarily a procedure of detergency. As the author states in the second paragraph of his paper, the amount of stimulation in toothbrushing may vary from a ". . . natural minimal amount of the Charters technique to the frequent and vigorous stimulation with an electric massage unit as advocated by Osserman." One might be safe in assuming that the toothbrushing action of detergency may vary in comparable proportions. To confuse the issue further, one might observe that the act of washing one's hands with soap and a scrub brush likewise includes elements of massage and detergency. It would be a mistake to presume that the health of one's hands under the influence of such a frequently repeated procedure would be due to the massaging effects rather than to the improved state of sanitation. As a direct corollary Dr. Stanmeyer makes the error of ignoring the value and effects of improved sanitation as a result of toothbrushing. I contend, therefore, that his deductions and conclusions with reference to gingival massage are invalid. Surely the significant decrease in gingival inflammation which he reports may be due to improved states of sanitation and relief from the related chemical, bacterial and mechanical irritants.

Harry Lyons,
Dean, Medical College of Virginia,
School of Dentistry,
Richmond 19, Virginia

Letter To The Editor:

I feel duty-bound to reply to the "Letter to the Editor" by Harold Leonard which appeared in the January issue of the Journal of Periodontology. Doctor Leonard commented on some tendencies within the Academy that did not seem good to him, to quote—"One is the tendency to base periodontal practice too exclusively on oral pathology, with a resultant reliance on various surgical techniques for removing pathologic tissue." If Leonard is against surgical techniques, that is his privilege, but to blame oral pathology for surgical methods is a completely misconstrued, prejudiced attitude to which I object. In fact, the so-called "radical" surgeons of the past did not base their techniques on oral pathology and the objections which have been voiced against such surgical procedures have been based on principles of oral pathology. These discussions can be found in the literature of the past twenty-five years!

I do not want to create the impression that I favor surgical methods above the non-surgical methods. Each has its place and the proper diagnosis, treatment planning and prognosis will dictate the method of choice. We should be extremely happy that more and more methods are offered us in treatment of various periodontal conditions. After perfecting certain of these techniques, it is up to us to develop proper judgment in deciding by which method each case is best treated.

Root planing, subgingival curettage, reattachment attempts, flap operations, gingivoplasty, osseous surgery, gingival repositioning by various methods, development of a good fornix, frenulectomies all have their places in periodontal therapy. We also know that none of these procedures will succeed without postoperative cooperation of the patient.

The statement by Leonard, "I find it unnecessary to contour the tissues even in cases of previous ulcerative gingivitis where interdental gingivae have been lost and interdental depressions exist" is too much of a generalization. I, too, have had cases of this type where no surgery was necessary, but that does not mean that it happens every time. There are many factors that dictate the choice of treatment in such a case. I would rather say that it is my knowledge of oral pathology which dictates the best method, and it may just as well be, the lack of it which many times brings a wrong judgment!

The time required for treatment of a case will depend upon many factors, including severity, extent of the pathologic condition, the patient's attitude and sense of cooperation. It is, again, only a prejudiced attitude to believe that surgical therapy is more time consuming and more expensive than the non-surgical. It will depend upon what has to be done and to some extent, to whom and by whom. I have performed a full mouth gingivectomy with post-operative treatments in less than six hours, but, on the other hand, have done cases of root planing and curettage that have taken more time than that!

It might also be true that a good result with which one man is satisfied would not satisfy another!

B. Orban
Colorado Springs, Colorado